October

25 Cents

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

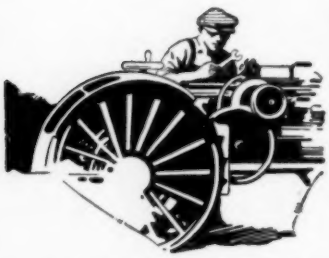
LANDING FROM THE NON-STOP AIR EXPRESS

See Page 511

It takes *only* 8 weeks to get a big job

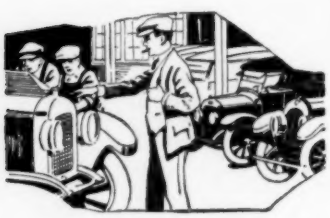
Read what these men are doing in the Auto and Tractor Business. Here is your big chance to get "on easy street." Come to these great shops on the biggest FREE offer ever made.

O. H. Justus owns a big agency and repair shop at Parkersburg, W. Va. He says "that my schools give motor secrets that will put any man 'on easy street.'"



Emanuel Rushfeldt, Alberta, says: "Earning $10 a day and only 20 years old."

W. W. Peace gets $250 a month and expenses operating a tractor in the oil fields.



Louis Beimer at 24 was made foreman over men many years older. That's not luck—*it's Rahe training.*

Big Firms Need Trained Men

The Auto and Tractor Business is on the boom. Thousands of trained men will be needed during the next few months. I get calls every day from Garages, Battery Stations, Auto Repair, Welding Shops and other successful concerns for Rahe men. When the big fellows need high grade men they know where to come for them. They want Rahe trained men.

My Training Unusual

Scientific tool training—that's the secret. You do things here according to the latest engineering standards. Thousands of dollars have been spent in modern tools and equipment. That's why my men are at home in the biggest shops in the country. If you want to succeed the way Beimer and Justus and the rest have—qualify by the same method.

I'll Pay Your Railroad Fare and Board You

In order to fill the openings that now exist, I am making an offer no one has ever made before—**Free railroad fare, Free board.** But even that is not all. I'll tell you about the rest in my letter.

Send for FREE Book

My big illustrated training book tells how others are succeeding. It tells many things you ought to know about Autos and Tractors. Write for it and my **short time** offer NOW. It soon expires.

Rahe Auto & Tractor Schools

CHICAGO 4445 Grand Blvd. **Dept. 896** **CINCINNATI** Ninth and Walnut

Rahe Auto & Tractor Schools,
Dept. 896, (address school nearest you)
Chicago, Ill., or Cincinnati, Ohio.

Without any obligation, send me your big free book, "More Money." Also information regarding special temporary offer.

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Popular Mechanics Magazine

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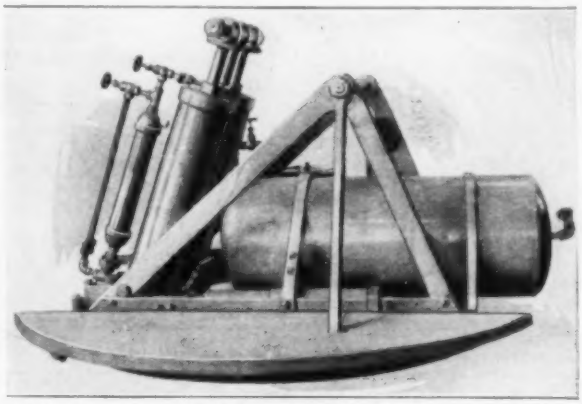
WRITTEN SO YOU CAN UNDERSTAND IT

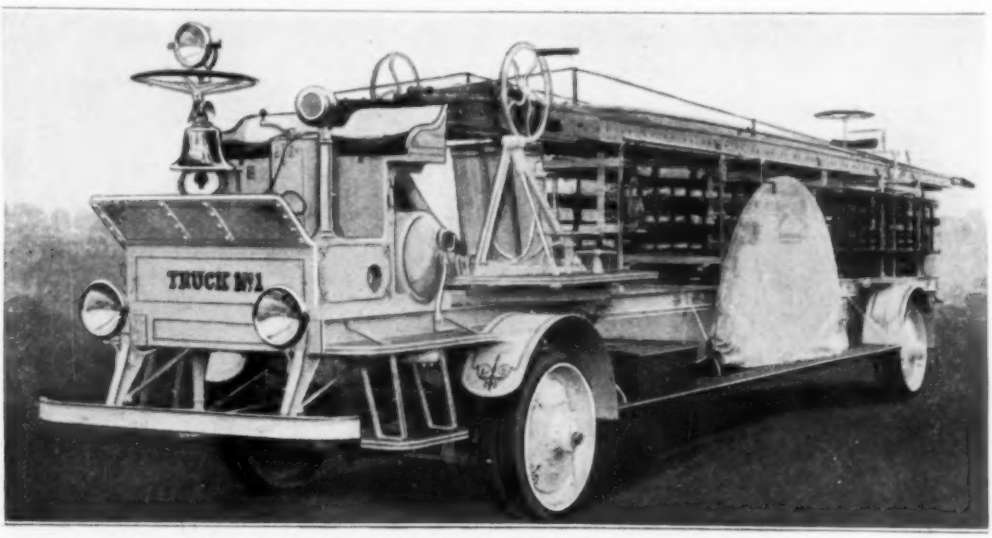
Vol. 38 OCTOBER, 1922 No. 4

Electric Fire Truck Has Four-Wheel Drive

FIRE-FIGHTING apparatus has been improved upon to the extent of equipping large trucks with individual motor drives in each wheel and raising or lowering the ladders by air and hydraulic pressure. The current for the driving motors is supplied from powerful storage batteries which are suspended beneath the frame of the vehicle. While the wheels appear to be of the ordinary disk type, they possess removable covers, so that the mechanism can be quickly and conveniently exposed for proper maintenance. An air compressor, driven by a gasoline engine, is incorporated in the outfit and furnishes the necessary elevating power for the heavy ladders, the lowering of these being accomplished with the aid of oil brakes, or compression cylinders. The action of the ladders is so simple that but one man is required to operate them, thus facilitating the actual fire-fighting work after the apparatus arrives at the scene of the blaze. The advantage obtained in many localities by the installation of these virtually noiseless electric trucks is obvious, and it is thought that they will be adopted by many cities.



Ladder-Operating Mechanism for Fire Truck, Showing, from Left to Right, the Small Oil Cylinder, the Three Air Cylinders, and the Compressed-Air Tank



Latest Type of Virtually Noiseless Electric Fire Truck Which Contains an Individual Motor Drive in Each Wheel, and Has a Mechanism for Raising or Lowering the Ladders, Operated by Compressed Air and Oil

PROTECTS SHIRTS OR WAISTS ON AUTOMOBILE TRIPS

Protecting the backs of shirts and waists during a hot and dusty automobile trip, when the occupants naturally perspire from the heat of the back upholstery, is possible with a simple arrangement. The contrivance consists of a piece of paper fitted with small adhesive disks which are fastened to the clothing before entering the machine. These shields, or papers, are quickly removed at the termination of the trip, after having prevented the pleasure of the ride from being marred by the prospect of soiled and sometimes ruined garments.

The Garment Protector, Shown in Detail in the Insert, as It is Worn, and Also Result of Not Wearing It

MOUNTAIN PASS HAS NEW ROAD AMONG CLOUDS

The newly completed road through Tioga Pass in the Sierras of California connects Lake Tahoe with Yosemite Valley and puts Lake Mono within reach of tourists who can view from the pass way, which reaches a height of 10,000 feet, some of the most impressive mountain scenery in the world. Mark Twain, who felt the grandeur of the mountains, describes Lake Mono as being "the loneliest tenant of the loneliest spot on earth, under the surface of whose dull waters no living thing existed except a small feathery sort of worm." The route is made safe and convenient to autoists by patrols with trouble cars and by service stations at frequent intervals.

MEN FIGHTING FOREST FIRE AIDED BY AIRPLANE

The airplane further demonstrated its usefulness in fighting forest fires, when a lumber company made use of one this summer in combating a fire that was raging on its property in the Province of Quebec. The plane was first used to reconnoiter the burning area and then to direct the men on the ground to the point where their efforts would accomplish the most. After that the aerial patrol made daily inspections of the fire area, so that the plan of attack could be adapted to any change in the situation. In addition, the plane was used to supply the fighters with food.

DURABLE WIRELESS UMBRELLA HAS DETACHABLE PARTS

A ball-and-socket joint for the ribs instead of the usual wire-stringing method is one of the many features of an umbrella recently brought out. Other merits are, that solid-brass nickelplated parts are used throughout, except for the steel frame and enameled-steel rod. The ribs can be easily attached or removed, and it is claimed that the cover can be replaced by anyone in only three minutes. Detachable handles of the ordinary type are provided, so that the umbrella may be carried in a suitcase or traveling bag. As a woman's or man's style of handle can be quickly placed on the article, the umbrella is an economical investment.

Left: Neat Appearance of the Wireless Umbrella. Insert: Manner of Attaching Handle, Also Ball-and-Socket Joint of the Ribs

RAILWAY COACHES REDUCED TO KINDLING WOOD

WHEN an engineer on the Missouri Pacific Railroad failed to heed a block signal near Sulphur Springs, Mo., recently, his limited train, composed of steel cars and running at full speed, crashed through five heavily loaded wooden coaches of a local train. Thirty-eight persons were killed and 137 injured. The picture gives a general view of the disastrous wreck, and illustrates how the heavy steel cars virtually made kindling wood of the antiquated coaches.

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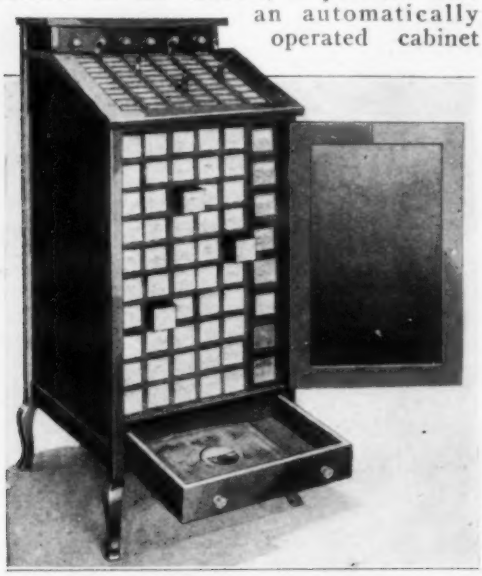
MUSIC ROLLS QUICKLY FOUND IN AUTOMATIC CABINET

Finding a particular music roll without the usual annoying search among all the records in the cabinet, is possible with an automatically operated cabinet

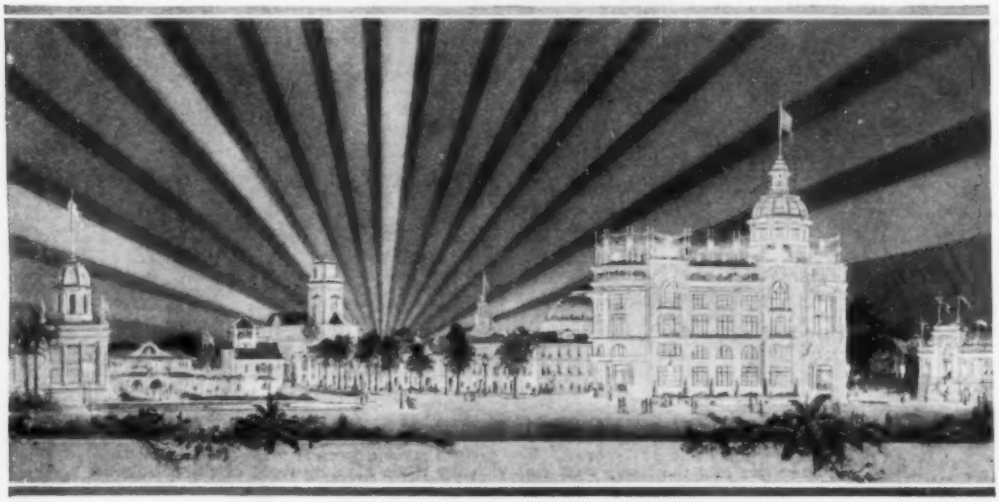


Music-Roll Cabinet Which Automatically Pushes the Desired Record Part Way Out of the Files, Thus Eliminating the Usual Search

produced by a western man. The top of the cabinet is built at an angle, and has six rows of interchangeable title plates arranged to correspond to the music rolls kept in pigeonholes below. A push button is at the head of each column, and between the rows are levers working in slots. When a certain roll is desired, a lever is adjusted to the name of the record wanted, the button at the top is pressed, and the roll slides partly out.

SPECTACULAR ILLUMINATION AT BRAZILIAN EXPOSITION

Brazil is about to celebrate its one hundred years of independence by an international exposition at Rio de Janeiro which will be notable for its wonderfully picturesque setting, for some striking specimens of architecture, and, perhaps more than all, for its spectacular and novel methods of illumination. The exposition will occupy an area of 50 acres, and will include exposition buildings of 13 foreign nations, and many large Brazilian buildings with beautifully planted gardens and parks. At night all will be made brilliant with a system of exposition illumination that is an elaboration of that adopted seven years ago at the San Francisco exposition, and designed by the same man who planned that installation. One striking feature in this illumination will be a so-called "scintillator," consisting of a battery of sixteen 31-inch arc searchlights, individually operated, and each provided with a set of five color screens. The searchlight beams will be projected radially, with constantly changing colors, and, in combination with fireworks and streams of water spray and steam, will produce some very interesting effects.



View to be Seen at the Forthcoming International Exposition at Rio de Janeiro, Brazil, Showing Effect of "Scintillator": The Apparatus Consists of a Battery of Sixteen 31-Inch Arc Searchlights Which Throw Their Beams of Light Radially over the Exposition Buildings. The Lights Are of Different and Changeable Colors

One of the New Small High-Speed Torpedo Boats, Recently Acquired by the American Navy, Making a Trial Spin: Of the Three Men Seated Amidships, the Middle One Is Secretary of the Navy Denby. The Boats are Known as "Coastal Motorboats"

NAVY ACQUIRES SMALL SPEEDY TORPEDO BOATS

TWO small high-speed torpedo boats, known as "coastal motorboats," recently acquired by the U. S. navy from one of the largest speed-boat builders in England, have been assigned to the Naval Torpedo Testing Station, at Alexandria, Va. On their arrival at Norfolk, Va., they made a trial trip to Washington, a distance of 190 miles, which they covered in about 5 hours at an average speed of nearly 37 miles an hour. The experience of the late war showed very clearly that in modern navies small high-speed torpedo boats are most essential. The new boats are built with speed hulls, and are fitted with longitudinal troughs for discharging the torpedo, tail first, over the stern, while the boat is attacking at full speed. The boat is moving at about the same speed as the torpedo, and it has to be skillfully maneuvered to get out of the way of the torpedo, which thus has been fired without any knowledge of the enemy, and without any diminution in the high speed of the attacking boat.

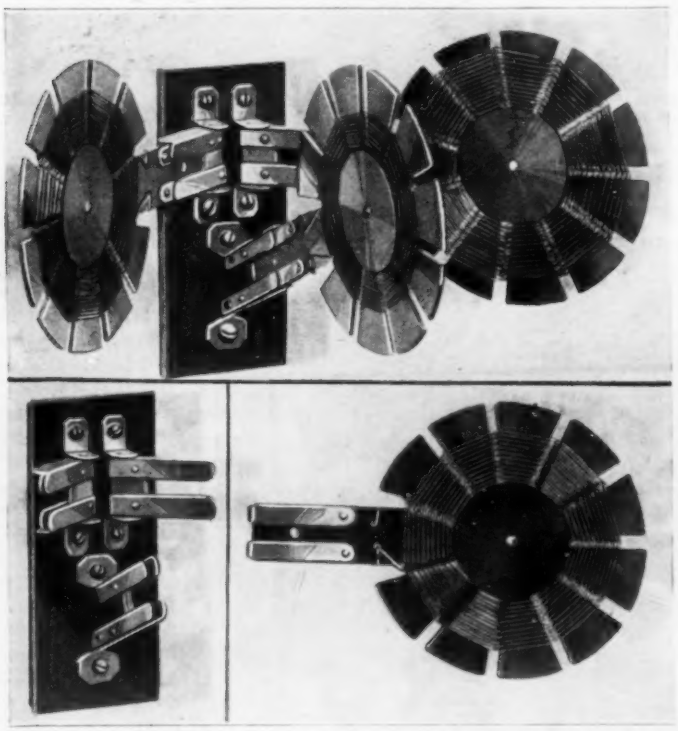
The Two High-Speed Torpedo Boats: The Nearer One Is 55 Feet Long with Two Torpedo Troughs, Seen at the Stern. The Smaller Boat Beyond Is 45 Feet Long

Many of these boats were secretly built for the British navy, and were used most effectively during the latter part

of the war against German submarines and mine layers. The two vessels of this type that now form part of the U. S. navy are respectively 45 and 55 feet long, the smaller having only one trough for an 18-inch torpedo, and the larger two. The smaller boat has a width of 9 feet 7 inches and a draft of 2 feet 9 inches, while the larger is 11 feet wide and draws 3 feet 3 inches of water. Each is fitted with the same type of internal-combustion engine, much on the lines of an airplane motor, but the larger boat has two, while the smaller is propelled by one. Each motor develops 375 brake horsepower at 1,550 revolutions per minute. During the war these boats were used also for mine laying, their shallow draft allowing them to pass safely over enemy mine fields, and their high speed enabling them to escape before being observed and attacked.

FAN COILS AND MOUNTINGS FOR RADIO SETS

Fan coils, used for tuning in radio sets, are being produced, together with a neat and attractive mounting, by a Pennsylvania manufacturer. The coils are made of bakelite and furnished wound with enameled wire, or delivered unwound if the amateur desires to use his own pet combination. The mountings are also of bakelite, with nickeled-brass holders for the coils, one of the holders being stationary, while the other two are pivoted to permit proper adjustment in the delicate task of tuning in.



Top: Three Fan Coils in Their Holders on the Bakelite Mounting. Lower Left: Bakelite Mounting, Showing the Two Pivoted and One Stationary Holder. Lower Right: Fan Coil, Showing Neat Construction

NEW PROTECTIVE MATERIAL FOR RADIOLOGICAL WORK

The necessity of better protective material in connection with radiological work has led to the production in England of a new substance made in either a pliable or a solid form. The former is for such articles as aprons, nurses' overalls, and the lining of tube boxes, while the latter is to be used for panel sections, portable screens, etc. The composition is a trade secret, and the ingredients vary, depending on whether the solid or pliable form is required. In tests, samples of the pliable form of 3.1-millimeter thickness, were found to be equivalent to 1 millimeter of metallic lead, and those of 5.3-millimeter thickness, equivalent to 1.7 millimeter of metallic lead. The results were the same whether the applied voltage to the tube was 100,000 or 120,000 volts. In the solid form, 9.9-millimeter thickness was found to be equivalent to 1.5-millimeter metallic lead, with an applied voltage to the tube of 100,000 volts, and to 1.3-millimeter metallic lead, with an applied voltage of 120,000 volts. A full-length apron, equal in protection to 1 millimeter of metallic lead, although weighing 19 pounds, has been made, by means of special supporting straps, more comfortable to wear than the lead-rubber variety. In the pliable form it can be produced in widths up to 26 inches and in any reasonable length and thickness.

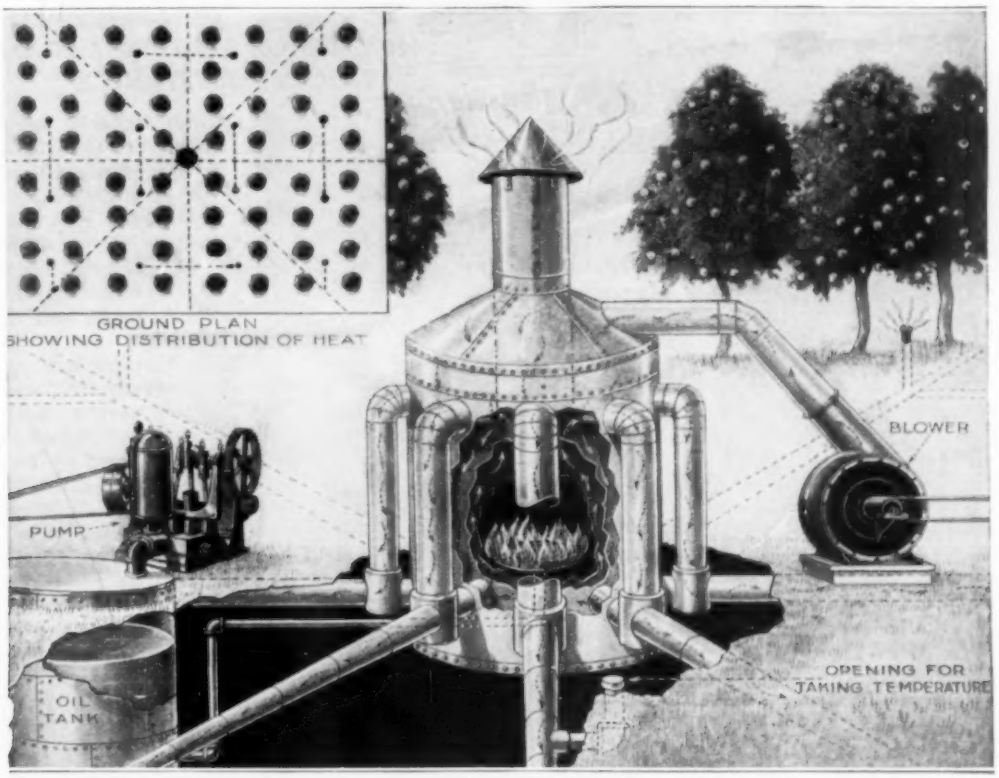
CENTRAL-HEATING SYSTEM FOR ORANGE GROVES

By C. R. BALDWIN

FROST prevention is an ever-present problem with the orange growers of California. A dependable system of frost prevention would be of immense value to them.

Recently such a system has been developed which shows great promise. It is a permanent installation good for many years of service. The plant consists of a central-heating furnace. Oil is fed under pressure from a supply tank to the burners by a small motor. A 30-horsepower motor is attached to a blower which draws the air into the heating chamber and forces it out through the distributing pipes. These pipes are of concrete, varying from 10-inch pipes at the furnace down to 3-inch pipes at the point of delivery. Vertical galvanized pipes with distributing caps deliver a stream of hot air directly under each group of four trees. The temperature of the air at the point of delivery is approximately 400° F., and dampers control the amount of air delivered. The inventor claims that his equipment can displace the cold air in an orchard with warm air to a height of 10 feet in about 15 minutes.

The distributing pipes from the central furnace are placed one to two feet under ground. When the period of plowing and cultivating comes, the distributing caps are removed and the pipes covered until winter.



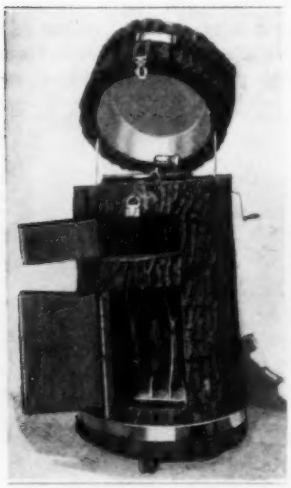
Sketch of Central-Heating Furnace for Orange Groves, or Orchards, to Prevent Damage to the Fruit by Frost: The Illustration Clearly Shows the Manner of Running the Many Heater Pipes, the Location of Vents, and Also the Position of Oil Tank, Pump, and Blower

PHILADELPHIA MAY BECOME LARGEST FLOUR PORT

Experts believe that the recent acquisition of storage facilities in Philadelphia will make that city the leading flour port in the world. The application to the shipment of flour of the efficient methods now employed for bulk grains, is expected to put American agents on a par with English millers.

OAKEN LOG IS HOLLOWED OUT FOR PHONOGRAPH CABINET

Hollowing out a large oaken log to make a phonograph cabinet, was the original idea conceived by the proprietor of a rustic ice-cream parlor in Davenport, Ia. The finished product, with its rough bark exterior, has an aluminum lining, a hinged cover, and houses the mechanism of a high-priced talking machine in the top, while below is a receptacle for the records Around the cover and base are placed two polished brass bands about two inches in width, which add to the appearance of the instrument.

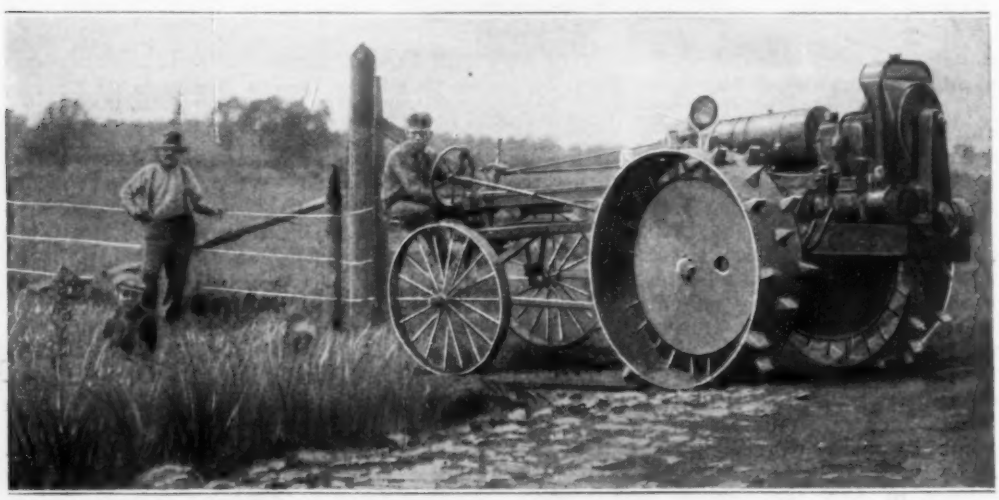


WIRE FENCES ARE STRETCHED WITH AID OF TRACTOR

Stretching barbed-wire fences with the aid of a tractor, was the method employed by a New York farmer to effect a considerable saving of time and labor. The implement used was a 9 to 18-horsepower machine, this being backed to the fence and a chain hooked to the wire, which was then stretched 1,200 feet at a time. Fences containing 1,000 pounds of wire were drawn taut in this manner, the farmer claiming that in one hour with the tractor he accomplished as much work as two men did by hand in half a day, which illustration of efficiency should appeal to all fence builders.

HIGH-VOLTAGE LOUD SPEAKER NEEDS NO BATTERIES

That it reproduces songs, instrumental music, speeches, etc., with just the right volume to be clearly audible in natural tones, is claimed for a new loud-speaker which has an odd-appearing horn of new design. The appliance is intended for use in conjunction with a third stage of amplification of radio broadcasts, and has been constructed to operate at a voltage of 100 or more, thus eliminating the use of batteries.



Tractor Outfit Which was Used by an Enterprising New York Farmer in Stretching Barbed-Wire Fences around His 170-Acre Property: The Powerful Implement, Rated at 9 to 18 Horsepower, is Seen at a Turn in One of the Fences, Where 1,200 Feet of Wire was Pulled Taut at One Time

NEW MOTOR-CAR TESTING APPARATUS GIVES COMPLETE ROAD PERFORMANCE DATA

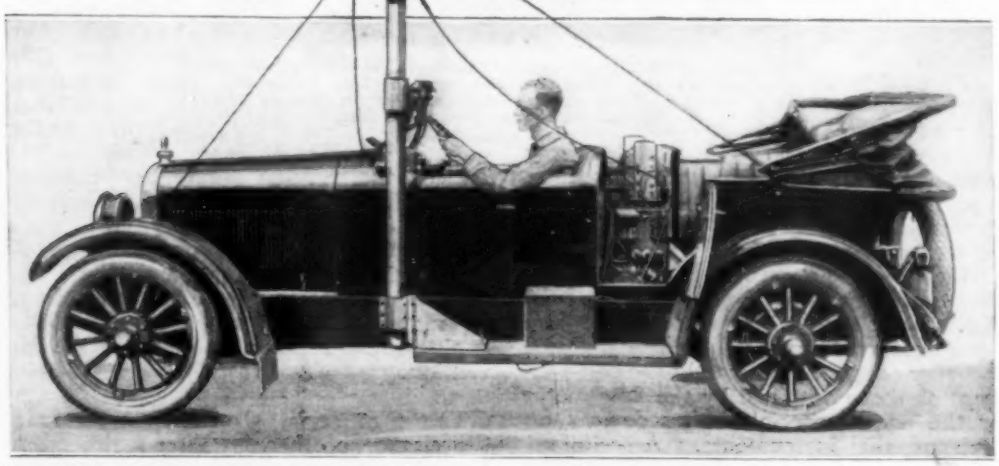
By G. H. DACY

ENGINEERS of the Bureau of Standards have lately designed an apparatus which accurately measures and records the performance of a motor car in road tests, and the first of these appliances to be built has just recently undergone trials with pronounced success.

It consists of a flow-meter camera, which makes a photographic record of the gas consumption, and a multiple recorder which keeps tab on 16 distinct and separate operations of various machinery parts of the automobile. The present equipment is for use on any type of motor car accommodating four or more passengers, but it is expected that it will also be adapted to smaller cars. It takes about one day to equip a car with the testing devices, another day to make the tests, and a half day to dismantle the car again.

The Flow Meter, Shown in White, Makes a Photographic Record of the Flow of Gasoline to the Carburetor

The multiple recorder, which is securely fastened to the frame of the tonneau, keeps track of the car speed over the road; the relative air speed; the acceleration and deceleration; power output; rolling resistance; manifold depression, and the changes in the temperature of the fuel, lubricants, inlet and outlet water, and other features associated with engine operation. After an official try-out of a motor car, the Federal engineers will know more about the automobile than its makers as regards its ability to handle gas and oil economically and operate efficiently. Briefly, the recorder consists of 16 automatic pens which operate as the car moves over the road and register data concerning the efficiency of this, that, or other important part of the machinery. This record is written on a roll of paper, which is driven by a small motor at a constant speed of .2 inch per second. The roll contains enough paper to continue the test for 1½ hours. In the camera, enough bromide paper can be carried for a two hours' test. The camera is so delicate and carefully adjusted that it will photograph the consumption of gasoline even where it occurs at so slow a rate as two drops per second. All the other results of the tests can be studied visually as

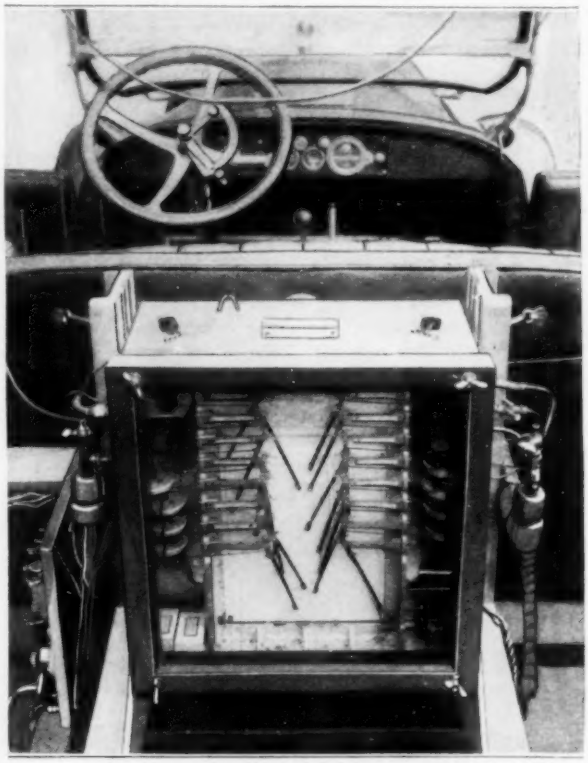


The Multiple Recorder, Shown Attached to Tonneau of Car, Gives Performance Data on Important Factors Involved in Motor-Car Operation. The Odd-Looking Device, Having the Appearance of a Weather Vane, is Constructed on the Principle of the Venturi Meter, and Measures the Wind Velocity

they are being made, the picture making being the only operation concealed from view.

One of the test appliances is a double-tubed Venturi meter which is used to record the speed of the car through the air. This curious device looks something like a weather vane. It is made of metal, bolted to the running board, and extends to a height of 4 feet above the top of the car. The device is built on a large scale so that it can measure air velocities as low as 10 miles an hour.

The test car of the Bureau of Standards was driven over 600 miles of good, bad, indifferent, and, in some stretches, almost impassable roads, thus subjecting the engine to every possible kind of a performance and efficiency test. The testing appliances recorded accurately under all circumstances, and were not damaged by the violent jolting and bouncing about of the vehicle.

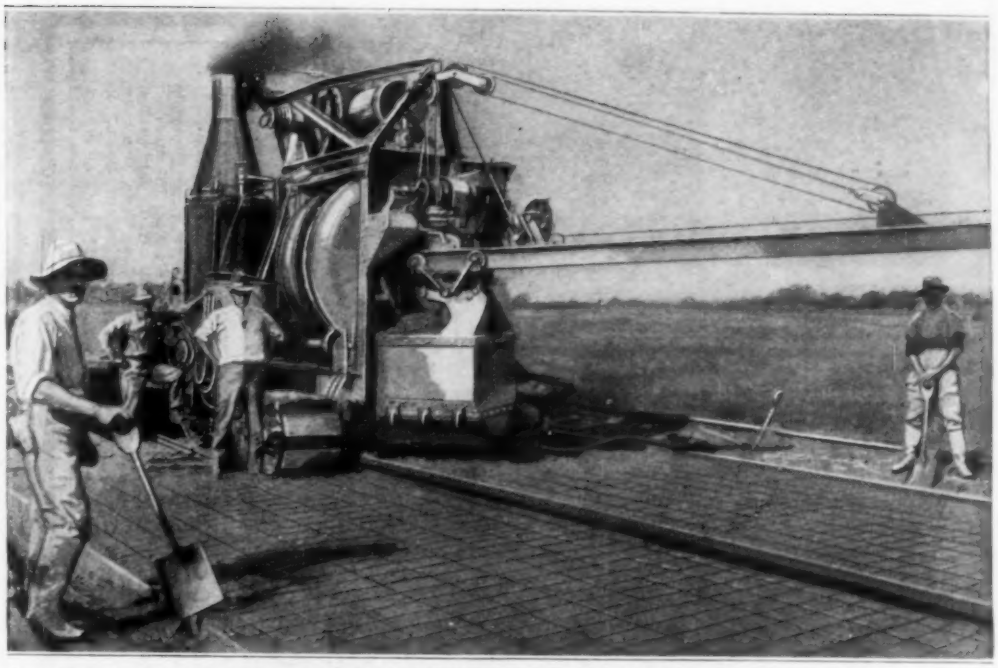


Close-Up of Multiple Recorder, Showing Glass-Covered Meter Box with 16 Pens, Each of Which Draws a Line Giving History, during the Test, of Some Individual Feature Entering into Operation of Automobile under Test

The flow meter is a vertical tube slotted parallel to its axis. A light piston runs up and down inside of this tube. The gasoline enters at the bottom and flows through the slot below the piston into a small space between the flow tube and the encircling tube of glass, which permits observation of the position of the piston at any given moment. The measurements registered by the multiple recorder are made at exactly the same instant as those obtained by the flow meter by the use of special timing devices on each of the instruments. A celluloid template is used in interpreting the records registered on the plain, unruled paper. This template is so graduated, and provided with calibrated pen paths, that it can be oriented in the desired positions on the record chart and used as the key for working out the conclusions. The pressure, temperature, speed, and timing devices used in connection with the multiple recorder are mounted on shelves at the sides of the recorder placed on the floor of the tonneau and connected to the recording pens by means of link wires. The speed of the motor car under test is recorded by use of an airplane tachometer. It is geared to one of the front wheels of the machine, its spindle being fitted with a small pinion and quadrant which are linked to one of the registering pens. The device has no time lag and records the average speed attained by the car during the preceding two seconds. Data regarding the engine speed are obtained from measurements of the car speed and the known ratio between the rear-wheel axle and transmission gearing. The data on the quantity of air used by the engine are obtained from pressure differences produced by the flow of air used by the carburetor through the Venturi meter.

Automotive experts from all parts of the country have examined the new apparatus and pronounced it satisfactory. They predict improvement in automobile-engine construction as a result of the invention.

¶The first aerial stowaway arrived in Cleveland the other day after a ride from Detroit, where he had sought a quiet sleeping place in the hull of a mail cruiser that was anchored in the harbor.



Steel Mats Laid on Foundation Ready for Imbedding into Concrete Subpavement of Improved Highway: This Construction has been Found to Meet the Requirements of Heavy Traffic and Eliminate Troublesome Surface Cracks

KEEPING CONCRETE ROADS FROM CRACKING

Flat sheets of heavy steel fabric are now imbedded in the most improved types of concrete roads to increase their life. The state highway departments of both New York and Pennsylvania have been so thoroughly convinced of the value of the innovation that hereafter the flat reinforcements will be specified in all contracts let by them. Of even greater significance is the use of a contraction joint in the center of the road, which overcomes cracking that has been hard to prevent hitherto. A dowel-type contraction joint forms a plane of weakness directly across the road. The slight contraction which takes place, instead of forming cracks like those of a drying mud puddle, will be effective at this plane of weakness. A fine hair crack is caused which is not nicked by the traffic.

WINDSHIELD AND SPOTLIGHTS FITTED TO A MOTORCYCLE

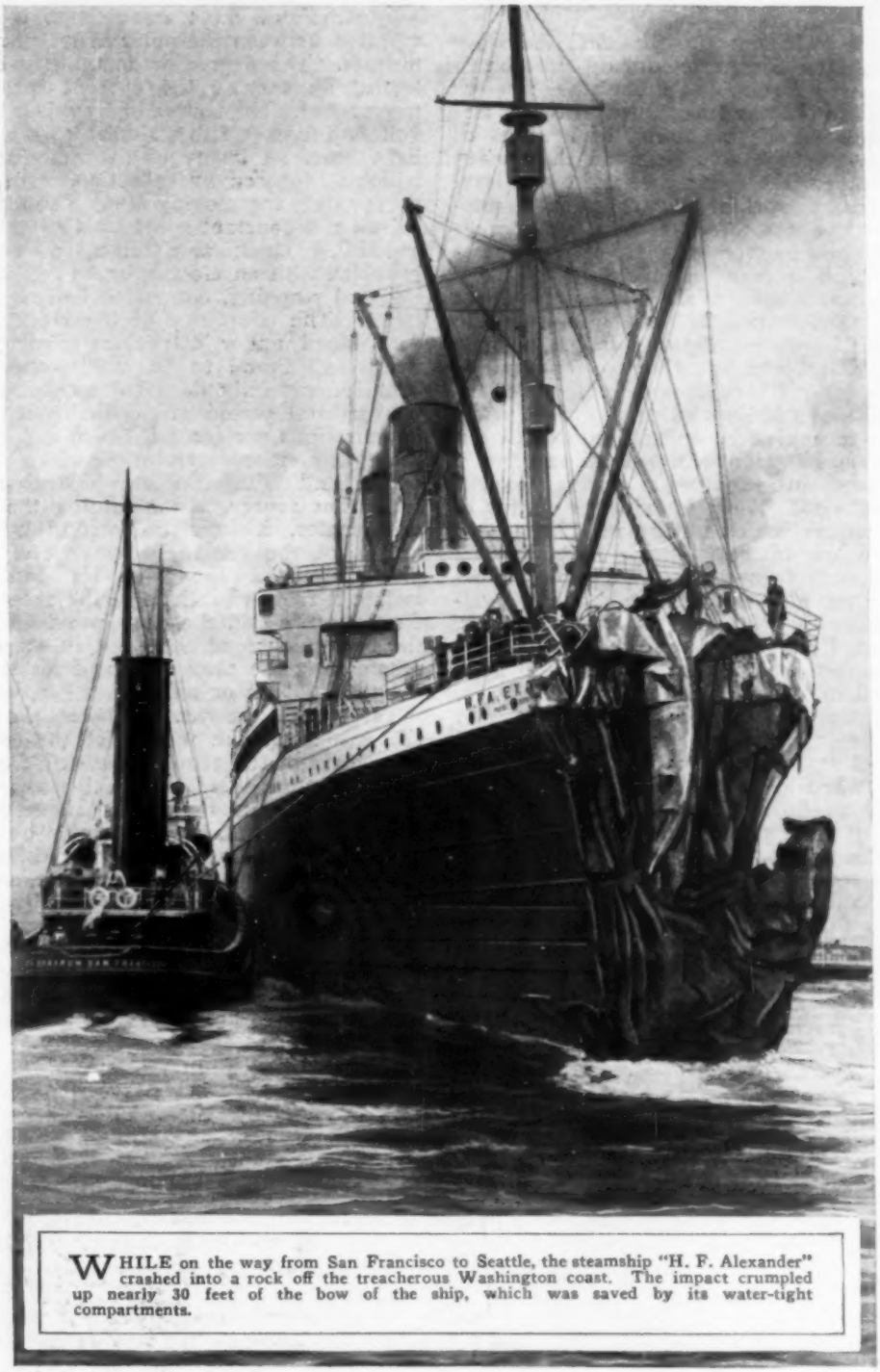
After cutting down the frame of a standard automobile windshield, and reglazing it, the owner of a motorcycle mounted it on the handlebar of his machine, behind the headlight. Connected to it are standard windshield spotlights, and the whole forms a very unusual equipment for a motorcycle. The windshield is adjustable, and the spotlights can be operated in the manner that is common on automobiles, but very unusual on motorcycles.

Front and Rear Views of Motorcycle Fitted with Standard Automobile Windshield Cut Down and Mounted on the Handlebar: Standard Spotlights Operate in Connection with It

DISABLED 9,000-TON SHIP TOWED 2,000 MILES

WITHOUT precedent was the recent performance of the American steamship "Ala," when it towed the steamship "Eastern Dawn," disabled 700 miles off the coast of England, the remaining 2,000 miles across the Atlantic. In fair weather and foul—very foul at times—the towing continued for 12 days when Nantucket Shoals was reached. Here a shipping-board tug took the "Eastern Dawn" in charge and towed it to New York.

SHIP SAVED FROM SINKING DESPITE CRUMPLED BOW



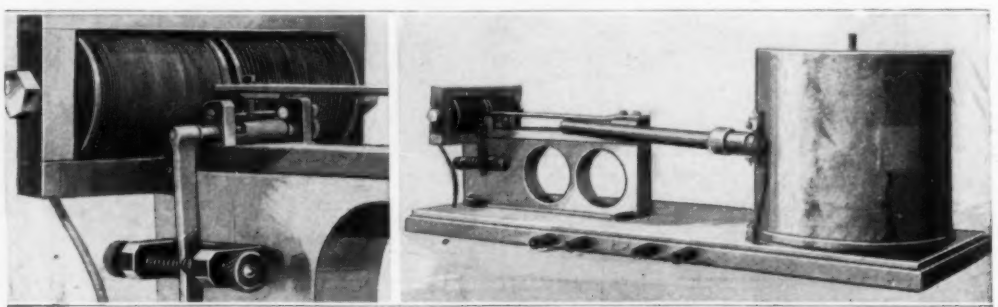
WHILE on the way from San Francisco to Seattle, the steamship "H. F. Alexander" crashed into a rock off the treacherous Washington coast. The impact crumpled up nearly 30 feet of the bow of the ship, which was saved by its water-tight compartments.

NEW INSTRUMENT RECORDS AIRPLANE STRESSES

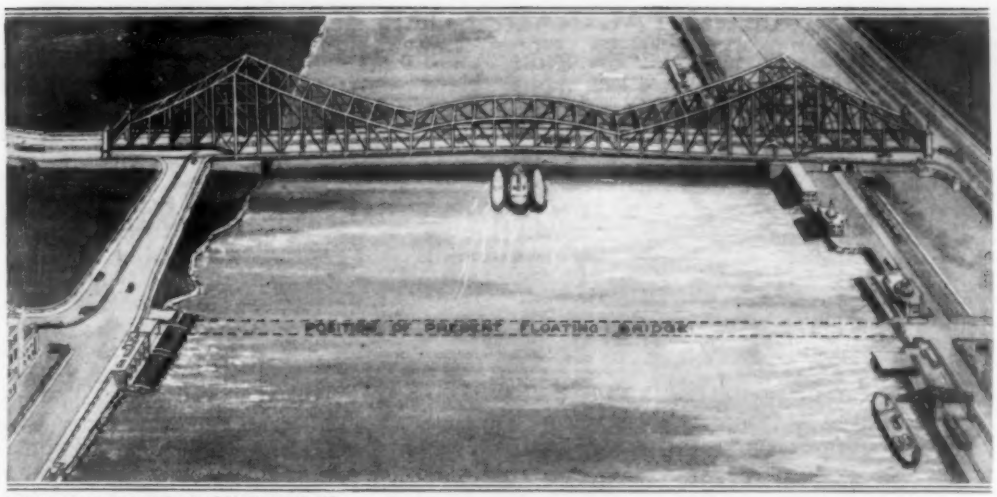
Not long ago the National Advisory Committee for Aeronautics undertook to obtain information about the stresses that are produced in maneuvering an airplane. At the beginning of a series of experiments it was observed that, when the plane was flying a straight and level course, a spring balance with a one-pound weight attached to it, would register just one pound. If the craft was put into a turn or made to rise, the apparent weight of the one-pound object increased to two or three pounds, while on a downward dip the spring balance would indicate less than one pound or even zero. From these data it was calculated that a 180-pound person might exert a force equivalent to any value between zero and 800 pounds, toward setting up stresses in the craft during violent maneuvers. There is evidence of this in the experience of an airman being thrust down into his seat, during a tight spiral, with such force that it is almost impossible for him to regain a standing position, or even lift his feet from the floor.

Based upon the conclusions of these tests, an instrument, which has been called an "accelerometer," was designed, to detect and record the variations and relative magnitude of the forces that tend to set up stresses in an airplane structure when in flight. In doing this, it also gives an unbiased record of the relative ability of pilots in handling their machines in the air, and in making a satisfactory landing. In the accelerometer, a flat steel spring is fixed at one end, while the other end is free to be deflected by any force acting at right angles to the plane of the spring. This deflection is measured by a light tilting mirror, which owes its ability to rotate to the deflection of the spring, and thereby throws a beam of light onto a moving film. The movement of the flat spring is damped by a thin aluminum vane attached to it and vibrated between the poles of an electromagnet. The degree of damping is controlled by varying the current through the magnet. The source of light is a low-voltage tungsten lamp, similar to a flashlight bulb, an image of the filament of which is focused by reflection from the mirror onto the moving film. The film is driven at a constant speed by a governor-controlled clock mechanism, which is provided with an electric brake for starting and stopping, controlled from a distance. The constancy of the clock was determined under conditions similar to flying and found to be within one per cent for carefully designed mechanisms. The natural period of the instrument is 70 vibrations per second, which is higher than any motor vibrations likely to occur, and eliminates any disturbances from that source. In mounting the accelerometer, it is placed within a few inches of the center of gravity of the plane, upon a sponge-rubber pad, to isolate it from vibrations of the fuselage. Two electric switches are provided for the convenience of the pilot in starting or stopping the clockwork and for turning the light on or off.

Tests with the accelerometer showed that whenever the wheels of the plane were clear of the ground, the entire craft had a constant vibration which was independent of the motor speed. It was also shown that excessive strain may be put upon an airplane structure by an unfavorable landing, and that running it needlessly along the ground, after landing, is likely to cause more vibration than the actual landing, especially on rough ground. On the other hand, the forces that are produced by accelerations arising from a spin are not great, unless the craft is made to dive precipitously.



Left: Close-Up of "Accelerometer," Showing the Flat Spring, Two Magnet Coils between Which the Damping Vane Vibrates, and, under the Spring, the Tilting Mirror with Lever and Thumbscrew Adjustment. Right: Accelerometer Assembled, with Recording Drum, on a Board for Mounting in the Airplane



BY COURTESY OF THE TIMES (LONDON) TRADE SUPPLEMENT

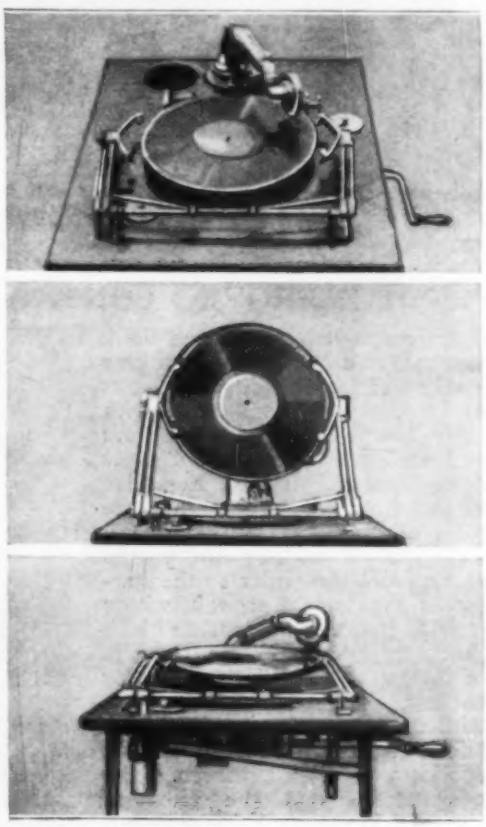
This Bridge, of Cantilever Type, will Span the Hugli River between Calcutta and Howrah, India, and will Have a Span of More than 1,400 Feet, and a Width of 100 Feet. It will Take the Place of an Old Floating Bridge, the Location of Which is Indicated

CANTILEVER BRIDGE TO SPAN HUGLI RIVER IN INDIA

At the present time, the only connection, by road, between Calcutta, India, and Howrah, on the opposite side of the Hugli River, is a pontoon bridge designed nearly half a century ago. Recent examination by a committee of engineers disclosed the fact that the entire structure was in extremely bad condition, and that, even with extensive repairs, it could be expected to last only a few years. It was, therefore, recommended that a new bridge of cantilever type be constructed some 600 feet upstream from the site of the present bridge. The span of the new bridge will be not less than 1,400 feet, with a width of 100 feet. Provision will be made for two railway tracks, sufficient space for six lines of vehicular traffic, and two 12-foot walks for pedestrians. It is estimated that the bridge will cost in the neighborhood of $10,000,000 and take 3½ years to build.

PHONOGRAPH RECORDS TURNED BY AUTOMATIC DEVICE

One can now place a record on his phonograph, start the machine going, and then sit down while it plays both sides of the record. When the needle reaches the innermost groove, a recently patented device raises the tone arm, swings it clear of the record, and turns the record over, laying it down on the turntable. At the same time the tone arm swings to the outer edge of the record, and the instrument starts playing again.



Three Views of Device for Automatically Turning over Phonograph Records: In the Center It is Shown Turning the Record Over

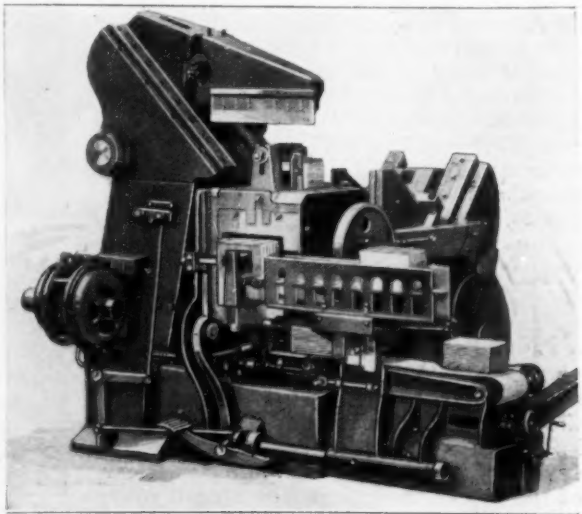
TRANSCONTINENTAL RADIO CAR MAKES FIRST TRIP

An automobile driving along the countryside or through the crowded thoroughfares of busy city life, amplifying radio news and concerts clearly audible a block away, is a rather stunning sight even in this day of the unusual. This has been the experience of the people along the route of a specially equipped radio car that has recently completed an overland trip from Detroit to San Francisco in less than one month. In spite of apprehension as to the effect of vibrations in the automobile, it was found that the apparatus was able to pick up and hold broadcast messages and programs of any of the various wave lengths of the eastern sending stations, with perfect reproduction, whether the car was traveling fast or slow. There was apparently no damage to any of the delicate equipment, although steady and rapid driving was necessary throughout the trip to maintain a schedule prearranged to the minute. Supplies were carried in another car.

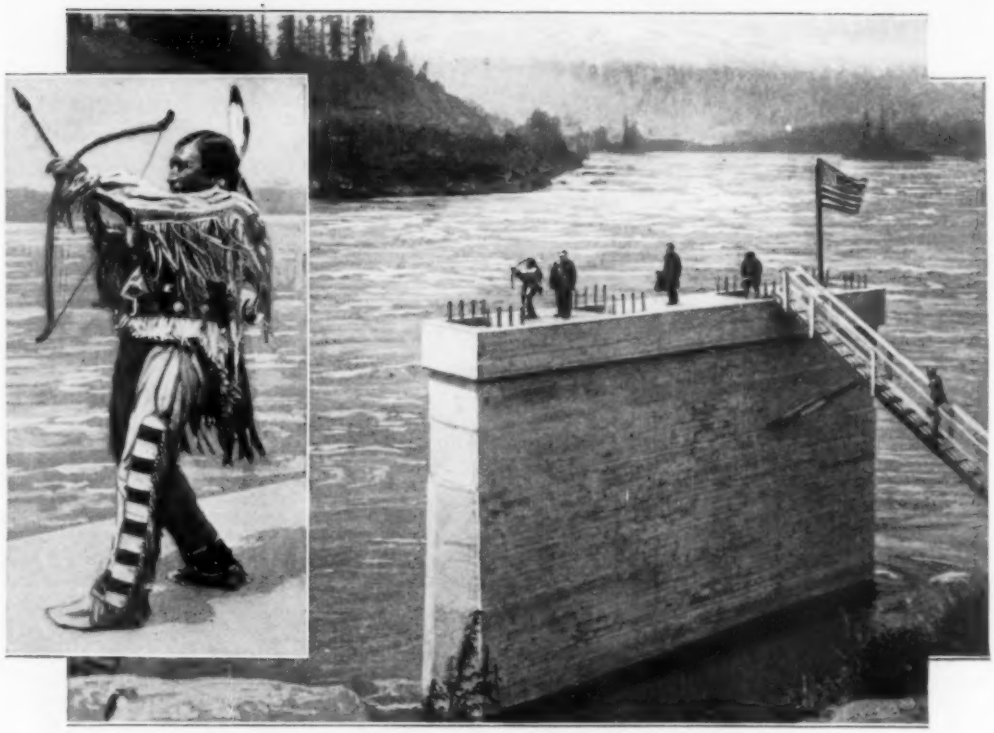
Automobile Equipped with Radio-Receiving and Amplifying Apparatus, Which Recently Completed a Successful Overland Trip, Giving Out News and Concerts along the Way

IMPROVED CONTINUOUS BOOK TRIMMER

An improved continuous book and magazine trimmer has a new method of jogging piles of books and chucking them true with their bound edges for accurate and uniform trimming. This is done in a trough feed, the sides of which are tapered so that the piles of books are automatically straightened as they are passed along from the wider to the narrower part of the trough, where it grips them. The pattern block that applies pressure to the pile of books, to hold it securely for cutting, is shaped to conform with the whole top surface of the pile, and is swiveled so that it applies a uniform pressure. The machine delivers the piles of trimmed books by belt conveyor, and all chips are removed by air suction.



Automatic Book Trimmer: It Has a Trough Feed, with a New Method of Chucking Books, and an Air-Suction Chip Remover

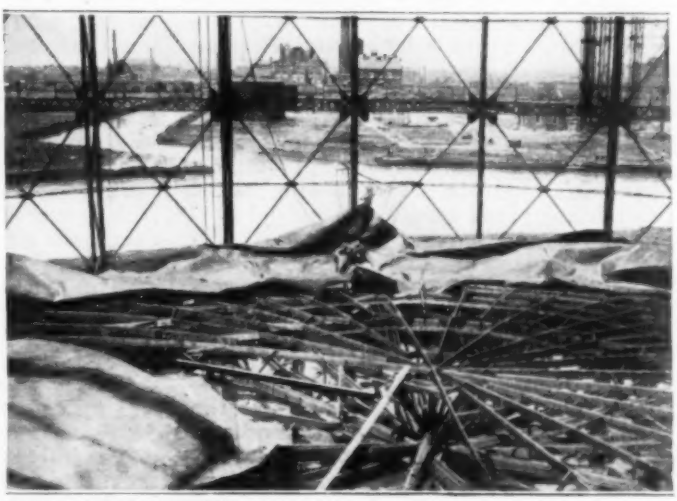


INDIAN PARTICIPATES IN BRIDGE-DEDICATION CEREMONIES

DEDICATION ceremonies were held recently in connection with the modern steel structure that is being built across the Columbia River at the site of the legendary "Bridge of the Gods," as described in the June, 1922, issue of Popular Mechanics. A son of a Klickitat Indian chief took part in the ceremonies. He stood on one of the finished concrete piers, and shot across the river an arrow which was supposed to trace the exact course of the legendary bridge, now being replaced by the modern steel span. Construction of the bridge was begun on February 2, of this year, and the engineers in charge of the work hope to have it finished by the fall of next year.

GAS HOLDER EXPLODES, INJURING 100 PERSONS

Thousands of dollars of property damage and injuries to over 100 people, many of them serious, resulted from the terrific explosion of an illuminating-gas holder at Chicago a short time ago. Parts from the top of the tank were hurled high in the air as the enormous volume of gas burst into a sheet of flame, sweeping over the roofs of houses and down upon the heads of pedestrians in near-by streets. This rare occurrence in the gas industry is thought to have been caused by escaping gas that in some mysterious manner became ignited.



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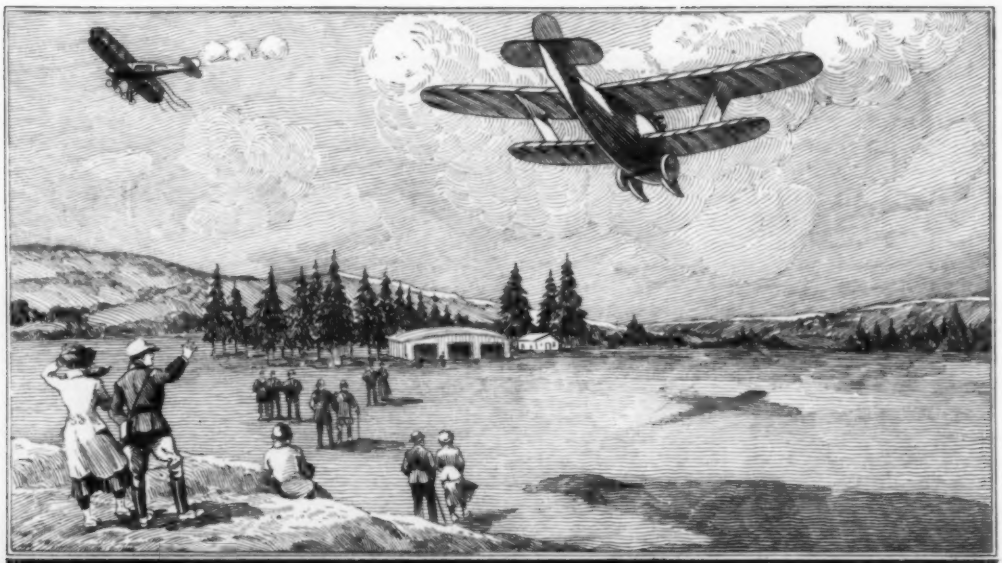
Wreck of Large Gas Holder Which Recently Exploded at Chicago, Doing Considerable Property Damage and Injuring Many People as the Flames Shot into the Near-By Streets



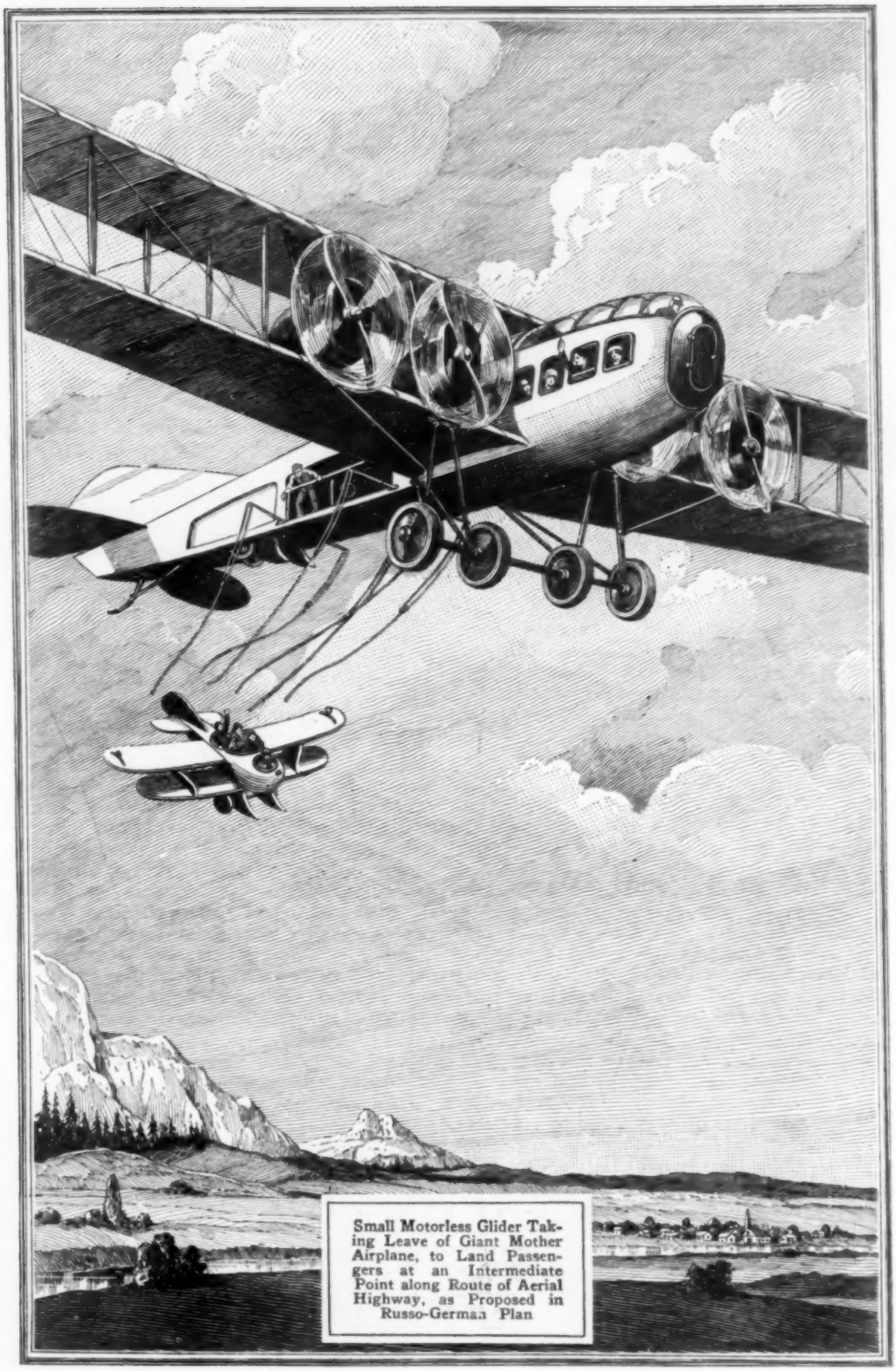
LANDING *from the* NON-STOP AIR EXPRESS

By R. C. FOLGER

CONSIDER yourself aboard a giant airplane whose whirring propellers rapidly drive from view faint objects on the earth far below. As towns and hamlets recede in the distance you realize that you are fast approaching the one that is your destination, for the captain is giving orders to make ready for the discharge of passengers at one of the intermediate points along the route of the great air liner. The crew unfold from the capacious hold a small air boat, and lower it dangling from the huge hull by its special tackle. You and several fellow passengers climb down into the seats behind the pilot and buckle yourselves in as the big ship slows its engines to enable the little wings to catch the air. With a quick movement of a lever your steersman unleashes the small craft, which begins its motorless flight and gracefully glides downward to a safe landing, while the mother plane speeds out of sight.

Jules Verne's imaginary voyage in "1,000 Leagues under the Sea," we have seen so nearly realized in the exploits of the submarine of today, that it is not too far a stretch to consider possible air travel as announced by a German-Russian combine, which plans an organization for connecting the 5,000 miles over the steppes of Russia and the frozen wastes of Siberia, between Moscow and Vladivostok, with a service similar to the one depicted. Even now, large high-powered airplanes of all-metal construction are being built under contract to carry as many as 100 passengers for 1,000 miles or more without stopping, and in the recent feats with gliders it is not impossible to see their adaptation to this use.

After the war, the Germans turned to motorless planes as a means of improving their planes to be motored with limited power, and Americans interested in flying, as well as some men in other countries, also began the construction of gliders. In June, a young American experimenter, flying in a plane of his own design, made a series of successful flights. These attempts to fly with motorless planes have generally been looked upon as a source of amusement that would appeal to the sporting instincts of many young men, or at most as a source of data leading to more efficient designs of motored airplanes. An international glider contest was held in France this summer in which there were entrants from many nations, and it was thought that great strides had been made. Only a few days later, however, a former German military airman, flying at a meet in the Rhine valley, eclipsed all former records for motorless flying, by making a sustained flight of over two hours in which he rose to a height of 3,000 feet and landed six miles from his starting point. Fokker, the famous Dutch airplane designer, has since added another record to motorless aviation by remaining in the air 13 minutes with a passenger, and maneuvering his glider like a power-driven plane.



Small Motorless Glider Taking Leave of Giant Mother Airplane, to Land Passengers at an Intermediate Point along Route of Aerial Highway, as Proposed in Russo-German Plan

TOOL-CARRYING ATTACHMENT FOR USE OF CARPENTERS

To be attached to the overalls, or to a belt, a tool-carrying device has been developed by a Seattle carpenter. It is

Left: Tool Carrier Attached to Overalls. Right: Method of Releasing the Tool from the Carrier

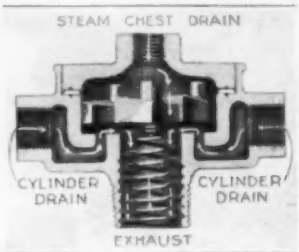
designed for a hammer, hatchet, or similar tool. It has two metal lugs which are caused to grasp the tool handle by the action of a spring latch operated by the weight of the tool. The hammer is grasped by the head and dropped, handle downward, between two protruding shoulders. In releasing it, the tool is grasped by the forefinger and thumb, while the palm of the hand is pressed against the protruding latch.

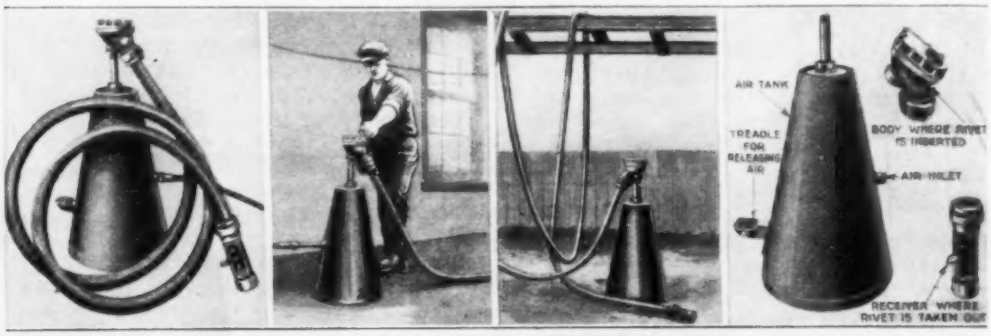
MECHANICAL DEVICE PASSES RIVETS AUTOMATICALLY

A pair of tongs in the hands of a skillful heater and an empty tomato can on the receiving end, has so long been the means of relaying hot rivets to the man with the hammer, that it is interesting to know about a mechanical gun that does this automatically. The red-hot rivet is placed by the heater in a suitable cavity at the head of the gun, from which it drops by its own weight, through a downward-opening valve, into a small chamber, the valve automatically closing behind it. Pressure on a treadle admits air into the chamber behind the rivet, which is forced out and into a length of flexible tubing ending in a suitable receiver, from which the rivet is easily extracted. It is claimed the standard machine can deliver rivets 125 feet and as fast as they can be received.

DRAIN AND RELIEF VALVE FOR STEAM CYLINDERS

For use on any reciprocating steam-operated equipment as a means of draining condensation from the cylinders and steam chest, a relief valve that is self-opening and self-closing has recently been placed on the market. It is of the disk-valve type, and an adjustable spring raises the disk from its seat automatically when the engine is at rest, thereby permitting water to escape through by-passes to the waste pipe. When the engine is running, the disk is seated by the pressure in the steam chest, and any excessive pressure at one end of the cylinder will overbalance the steam-chest pressure, relieving this excessive pressure and also permitting water to escape from the other end of the cylinder.





Left: Machine for Passing Rivets Automatically. Center: Man Operating Machine Which is Also Shown Set Up for Field Use. Right: View Indicating the Various Parts of the Machine Which Sends the Rivets as Fast as They can be Received

Ski Slide at the University of Wisconsin That was Designed Mathematically to Make Possible a Leap of 115 Feet: Inset Shows the Profile of the Ski Slide Drawn to the Scale Given Below. The Dotted Line Shows the Path of the Skis of a Jumper with a Fall of 58 Feet

LAWS OF MECHANICS APPLIED IN SKI-SLIDE DESIGN

In direct contrast to the old Norwegian practice of having the country's most experienced skier "guess" the best design for a contemplated ski slide, students at the University of Wisconsin determined the profile of their ideal slide mathematically. The topography of the hill was obtained with surveying instruments, and drawing instruments and calculations did the rest.

The "take-off" point, from which the leap into the air is made, was located on paper by moving the jumper's trajectory into the position which gave the maximum leap, the length of which is measured in the air from the take-off to the place where the jumper's feet resume contact with the snow. To determine the trajectory, the principle of the motion of a projectile was applied, approximations being made for the vertical jump of the rider and of his air resistance.

Actual results the past winter did not reach the theoretical, although it is thought that ideal snow and wind conditions will make the estimated leap of 115 feet possible. Thus far the longest jump for the hill is 103 feet, and it was made by the national amateur champion. The estimated speeds of 30 miles an hour at the take-off, and 50 miles at the foot of the hill, were undoubtedly reached, for they are calculated with ample allowance for air and snow friction. To watch the jumpers, one would think they were in the air almost a dozen seconds, but calculations show the period to be only 2¼ seconds.

Falling from a height of 58 feet without injury is possible because the landing surface is not hit squarely. Only a glancing contact is made with the snow, owing to the steep slope of the hill. Although 50 jumpers participated in the one meet held last winter, none sustained any injury worth mentioning.

¶In order to show to as many farmers as possible a system of crop rotation adapted to their needs, the agent of Thayer County, Nebraska, laid off at the county fair, on a patch of ground 7 feet square, a miniature farm divided into fields proportionately. Corn, oats, and wheat were sown in time to be in full growth when the fair opened, imitation orchards were planted around miniature farm buildings, and everything was in shape for giving practical demonstrations of the rotation system.

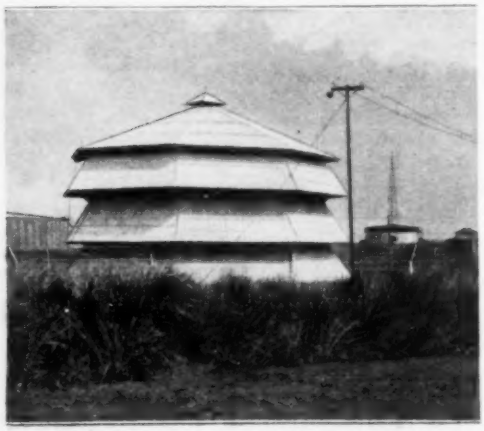
ADJUSTABLE FLOOR LAMP AIDS GARAGE OR SHOP

Floor lamps that can be adjusted to any desired angle, or placed so as to illuminate usually obscure spots in a machine shop or garage, are now available. The lamp is particularly adapted for making repairs on, in, and under an automobile, or around lathes, drill presses, etc., where delicate work is being done. The novelty is also manufactured as a wall or ceiling fixture and, owing to its extreme flexibility, the light can always be thrown exactly where it is wanted, thereby increasing the workman's efficiency.

Adjustable Floor Lamp, Showing How the Appliance can be Used to Good Advantage around Motor Cars

ODD-APPEARING PROTECTION FOR GASOLINE TANKS

Protecting gasoline tanks from the intense rays of the tropical sun in the Panama Canal Zone, and thereby reducing evaporation, is accomplished in an odd but effective manner. The tanks are set in depressions, as is common with these containers, and have the usual encircling dike. Around the sides of the tank are placed three corrugated-iron "petticoats," each of which overlaps the one beneath, while on the top is a corrugated asbestos "hood," that in turn is surmounted by a "monitor," or cap, of the same material, the whole presenting a strange sight.



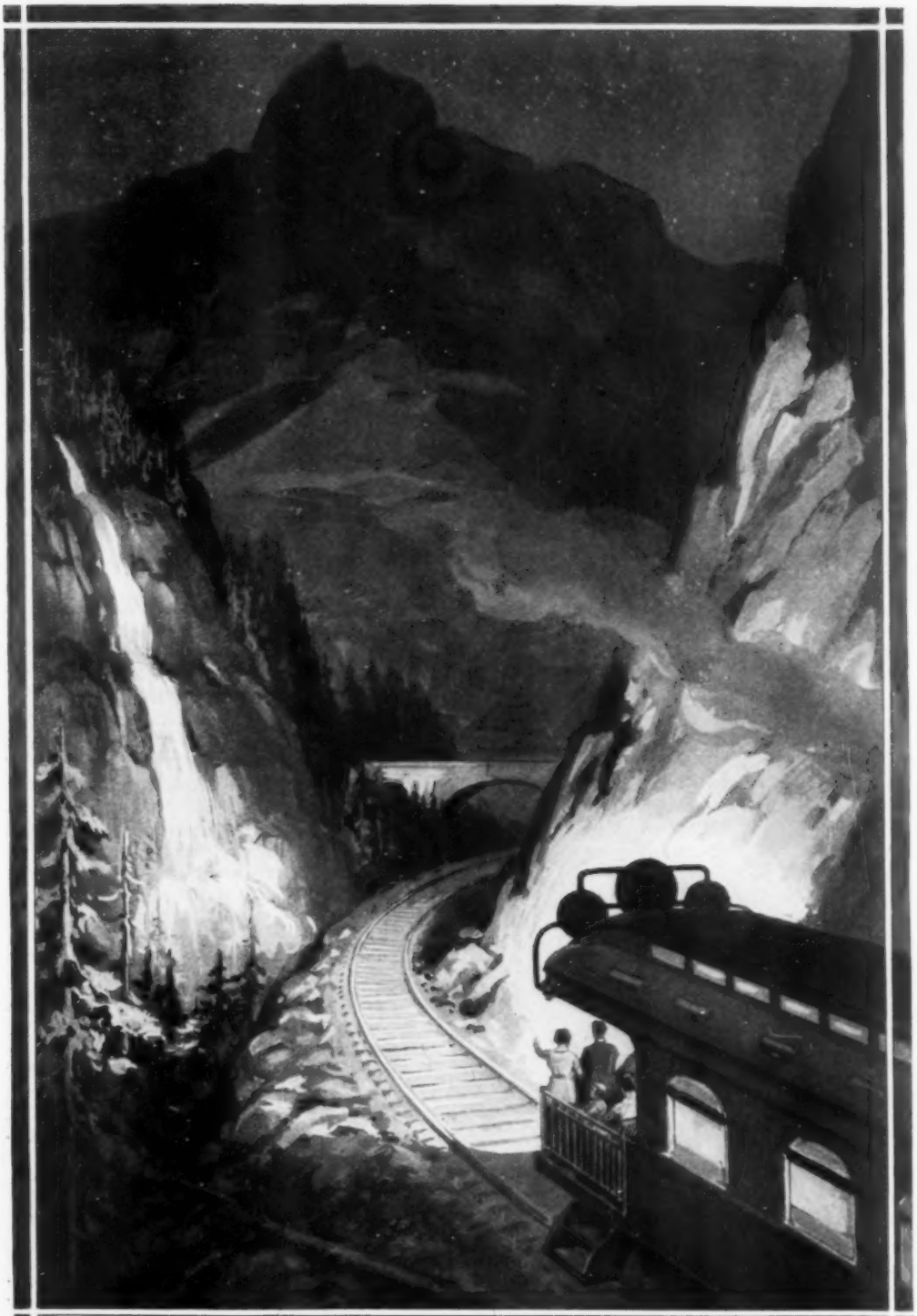
Gasoline Tank with Its Queer-Appearing Covering Which Protects It against the Intense Rays of the Tropical Sun

FLOODLIGHTS ON TRAINS

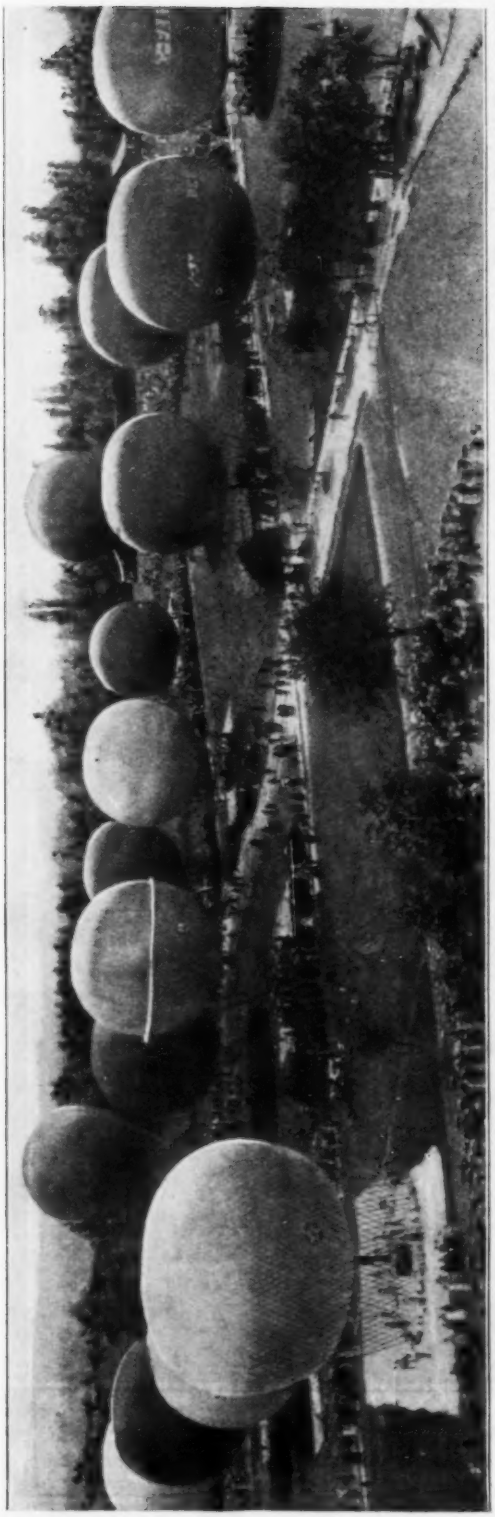
By H. A. LANE

BRILLIANT night illumination of its picturesque transcontinental route, is the plan contemplated by a large railroad system in this country. The idea, as conceived at present, is to equip the observation coaches of its fast limited trains with a battery of powerful floodlights. These lights would be arranged to cover a range of approximately 160 degrees, with sufficient height and depth to illuminate the cañons, rivers, lakes, and mountains in the vicinity of the right of way, as the train rushes on through the night. Power for operating the lamps would be furnished by the axle-driven generators with which railroad cars are now commonly equipped, and which ordinarily are never used to their full capacity.

Although, thus far, the location of the floodlights has been confined to the observation car, certain officials have suggested the advisability of placing them along the full length of the train. Also, further to enhance the effect, it has been proposed to employ lamps, or reflectors of various colors, which would undoubtedly yield fairylike scenes, particularly when directed upon snow-covered surfaces. Railroad men in authority have nothing but praise for the scheme, and while eagerly awaiting the completion of the initial floodlighting equipment, have pointed out the fact that there is an additional and practical value of the brilliant lights as a protection against rear-end collisions.



Observation Coach of a Railway Train, Equipped with a Battery of Large Floodlights for the Purpose of Brilliantly Illuminating the Vicinity as the Cars Rush through Narrow Gorges or over Picturesque Bridges, Thus Enabling the Passengers to Watch the Scenery at Night



View of Châtelaine Park, near Geneva, Switzerland, Showing the 19 Balloons Representing Seven Different Nations, Ready to Start in the Eleventh Gordon Bennett Air Derby: Perfect Weather Conditions Prevailed, and an Enthusiastic Crowd was Present to Greet the Various Balloonists as They Cut Loose Their Fastenings

INTERNATIONAL BALLOON RACE ENDS IN DOUBT

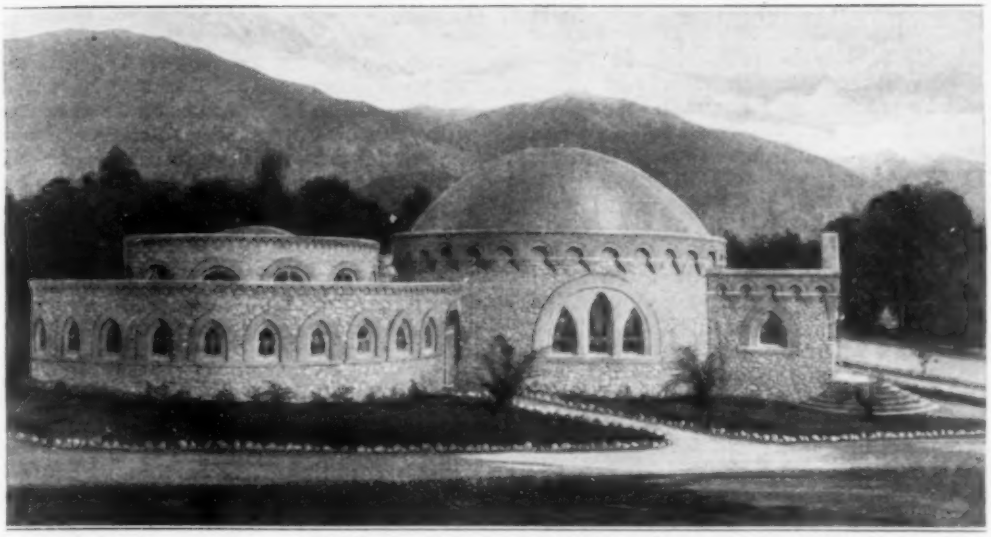
Nineteen balloons, representing seven different nations, started from Geneva, Switzerland, in the eleventh Gordon Bennett Air Derby, which took place this summer. The start was made under very propitious weather conditions and was witnessed by an enormous crowd which greeted with enthusiastic cheers the first American balloon to take the air. Decision as to whether the winner was Captain Honeywell, pilot of one of the American balloons, or Lieutenant de Muyter, the Belgian balloonist, was complicated by the reported escape of the latter's balloon some hours after he had effected a satisfactory landing, and remained unsettled when this magazine went to press.

AMERICAN AIRPLANES FASTEST IN WORLD

Realizing that the fast pursuit plane controls the air in time of war, the U. S. Army Air Service concentrated its efforts upon this type several months ago, and called for the construction of planes that would be speedier than others in the world. Recently four distinctly different models were delivered, all of which have a speed of over 200 miles per hour. One is of all-metal construction; one has its radiators built into the wings; one has a folding chassis, thus reducing wind resistance, and one has its wings under the fuselage, and open landing gear with no axles. The new landing device that replaces the rubber-tired wheels with skids similar to sleigh runners, except that they are fitted with shock absorbers, makes it possible to land and stop in a distance of 125 feet, and also permits landing on water.

BEAUTIFUL CHURCH BUILT AT SMALL COST

Although built without architectural drawing or specifications of any kind, a small church recently dedicated in a western state, presents an appearance of beauty. The structure, named "Bethany Temple," was erected for a Protestant body, solely



Beautiful and Inexpensive Church Which was Constructed, Mostly of Bowlders and Cement, by Two Men: The Dome of the Auditorium is Seen at the Front and the Smaller Dome of the Sunday School, at the Rear

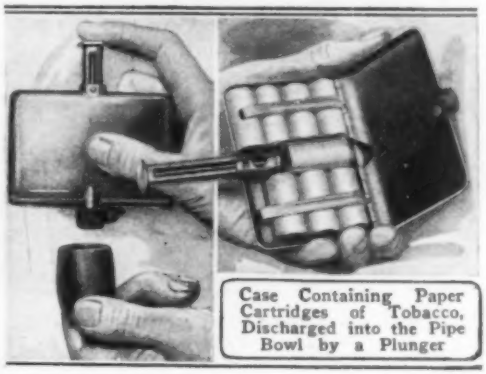
through the efforts of two men. One of these was a world-traveled and self-styled "Bible teacher," while the other termed himself "just a mechanic." The man who had marveled at the wonderful architecture of many churches during his extensive journeyings, furnished the structural ideas and rough sketches for the church, and the other man possessed the skill necessary to put the plans into effect. Financial straits caused the work to be conducted as economically as possible, and members of the congregation, numbering then but 50, offered stones from their own back yards. These, with bowlders hauled from neighboring cañons, composed the bulk of the building material. Slowly the mechanic labored single-handed at his task, and in 18 months completed the church, which consists of an auditorium seating 300 persons, and an adjoining Sunday school. Under ordinary construction methods, it is thought that the building would have cost at least $50,000, which sum the little congregation certainly could not have raised.

NONSLIP CONCRETE SURFACES MADE BY NEW METHOD

A European railway, where many of the steps and footways are made of concrete, is using extensively a simple method of making these surfaces nonslipping. Silicon carbide, commonly known as carborundum, and other artificial abrasives are sprinkled on and worked into the surface of the fresh concrete just before it sets. These crystals show little signs of wear and produce a pleasing effect.

COMBINATION PIPE FILLER AND TOBACCO CASE

Flat and convenient for the pocket, a combined pipe filler and tobacco case is now on the market in England. The tobacco is neatly contained in paper cartridges, each holding a pipeful, which fit the inside of the case. One of the cartridges is placed in the filling slot in the center of the case, which is then closed and held over the bowl of the pipe, when a small plunger on the other side of the case is pressed down with the forefinger, discharging the tobacco from the cartridge into the pipe bowl.



Case Containing Paper Cartridges of Tobacco, Discharged into the Pipe Bowl by a Plunger

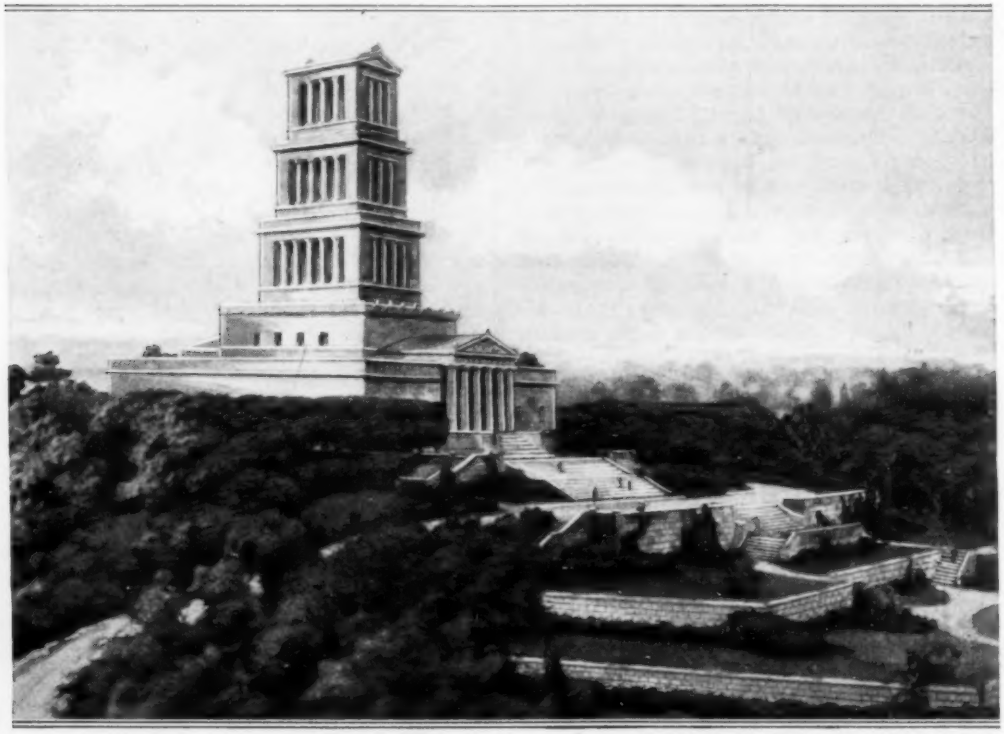
GEORGE WASHINGTON MASONIC NATIONAL MEMORIAL

By R. C. FOLGER

A NATIONAL memorial to George Washington, the man and Mason, will be erected on a commanding ridge at Alexandria, Va., on the road to Mount Vernon, and six miles from Washington, D. C., where it will be plainly visible. Its form is inspired by the ancient watch towers of Greece and Rome, by the light of whose burning flares the mariner steered through the harbor entrance, emblematic of the guiding spirit of Washington to our "Ship of State."

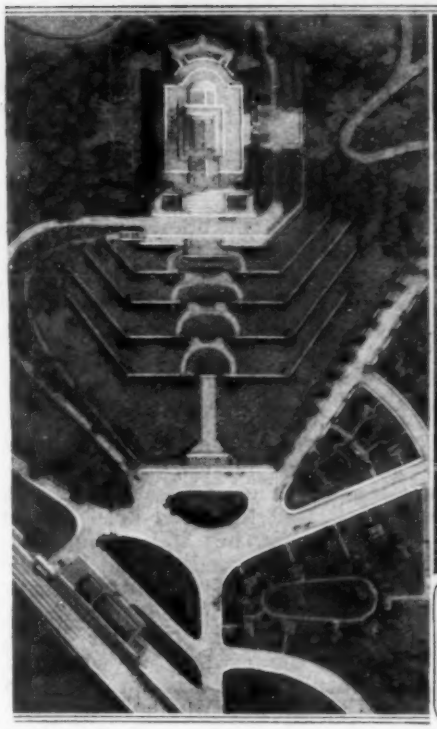
Resting on the topmost of seven artistic terraces, approached by broad walks and stone steps, the tower will rise 200 feet above its base to a view of all the surrounding country in which Washington spent so great a part of his life. The dimensions of the ground floor will be 160 feet wide by 230 feet deep, in the center of which will be a great room 70 feet wide by 100 feet deep and rising by a clerestory to a height of 64 feet to form the memorial hall. In an arched recess of the memorial hall, an imposing statue of George Washington will be placed. The second story, 50 by 75 feet, will be devoted to the George Washington Masonic Memorial Museum, where will be located the interesting relics connected with Washington's service as master of the Alexandria-Washington lodge, as well as many personal relics of Washington. Among these are the Masonic apron he wore at the laying of the cornerstone of the national capitol at Washington, D. C., and also the silver trowel he used at that time; the old Chippendale chair occupied by Washington as master of the lodge, and a fine picture of General Washington, by Williams. The third level will be for future assignment, and the fourth will be a covered observation platform. The memorial and grounds will represent an estimated outlay of more than $2,000,000, and it is expected the official ground breaking will be done this fall, as the contract for the excavation and foundations has already been let.

The movement for the memorial was formally initiated on Feb. 22, 1911, when the first regular meeting of the George Washington Masonic National Memorial Association was held at Alexandria-



COPYRIGHT, GEORGE WASHINGTON MASONIC NATIONAL MEMORIAL

This Impressive Memorial will be Erected by the Masonic Orders of the United States and Dedicated by Them to George Washington. It will be Fittingly Located near Alexandria, Virginia, around Which Center Many Historic Events Connected with the Life of Our First President



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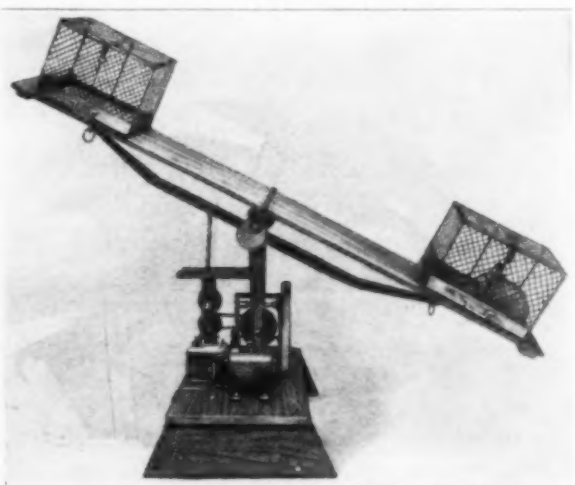
Left: Plan of George Washington National Masonic Memorial, Showing Grounds, Roadways, Terraces, Steps, and Location of Memorial Building. Above: Interior of Memorial Hall, Showing Recess and Statue of Washington. This Hall will be Flanked by Ionic Columns 40 Feet High, and will be Surrounded by Smaller Rooms

Washington Lodge No. 22, A. F. & A. M., which in Washington's time was lodge No. 39. This included representatives from 27 jurisdictions in the United States.

The plans for the memorial are the result of the work of a prominent firm of architects collaborating with consulting architects and famous landscape artists.

SCIENTIFIC SEESAW FOR STUDY OF SEASICKNESS

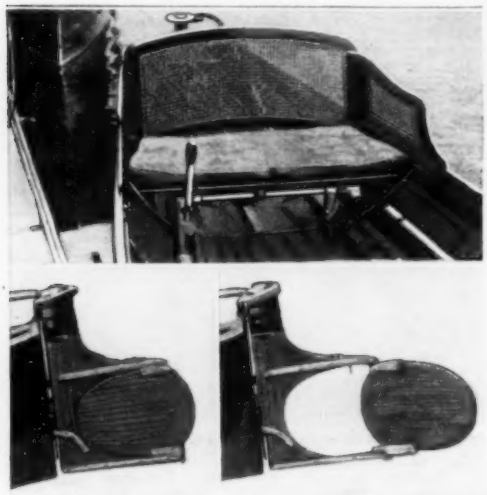
With the object of finding a cure for seasickness, an instrument has been devised at the instance of a French biological society for use in the study of the effects of rhythmic oscillations upon animals. The apparatus is composed of a board, 10 feet long and 16 inches wide, at each end of which is fastened a cage of the kind commonly used in laboratories. A ½-horsepower motor oscillates this board with movements corresponding to the pitching and rolling of a vessel at sea. These oscillations are controlled by a rheostat. Rabbits, chickens, guinea pigs, and pigeons have never shown any signs of suffering even after six hours in the moving apparatus. With dogs it was different, at least 30 per cent showing all the symptoms of seasickness. Experimental preventives are being tested, and it is believed that ultimately a cure for seasickness will be discovered.



Apparatus for Making Animals Seasick: The Motor Imparts to the Caged Animals at the Ends of the Oscillating Board a Movement the Same as the Pitching and Rolling of a Ship

A PROPELLING RUDDER FOR SMALL BOATS

A new idea has appeared in the shape of a propelling rudder, for use in connection with small boats instead of oars.



Above: Lever Which Actuates Propelling Rudder, Operated from Stern Seat. Below: Rudder Closed for Steering Only, and Open for Propelling

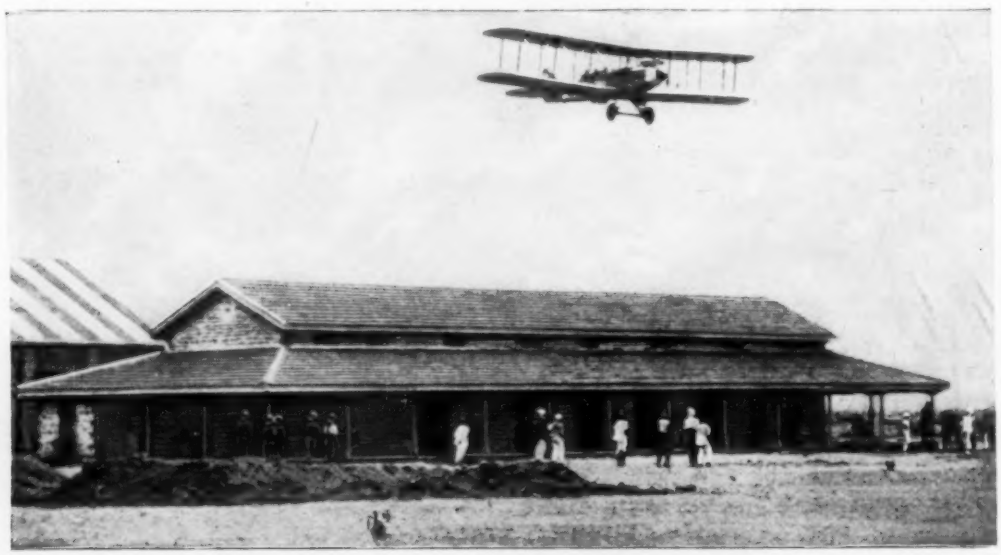
With this attachment one can sit facing forward in the boat, and simply move a lever back and forth. The lever is attached to the yoke or top pin of the rudder, which is caused to weave from side to side like the fin of a fish so as to propel the boat forward.

NEW TYPE PERMITS SIGHTLESS AND SEEING TO CORRESPOND

A new type system, developed in France, which serves as a medium of correspondence between the blind and those who see, follows very closely the form and characters of the Roman alphabet, except that the letters consist of a series of dots instead of full lines. The idea is to supplement rather than replace the Braille system of printing for the blind, and it has the approval of the Interallied Congress of Mutilated.

ROUND-THE-WORLD FLIERS HALTED IN INDIA

Recent reports of the airmen who set out from England on May 24, this year, in an attempt to encircle the globe in an airplane, indicated they had been lost in the wilds of India, but it has since developed they were forced to land because of engine trouble. Previously the flight had been temporarily halted at Karachi, India, owing to illness of Major Blake, the leader of the expedition, who was forced to abandon the attempt and turn it over to Captain MacMillan. The plans are to fly from India by way of Burma, Japan, and the Aleutian Islands to the Alaskan peninsula and thence down the coast to Vancouver. From there the airmen intend to fly to Halifax, where they will transfer to a flying boat and cross the Atlantic by a route to be determined according to the season.



The Airplane Used by the English Airmen Who are Attempting to Fly around the World, is Here Seen Flying over the Officers' Quarters at Karachi, India, Where the Leader Abandoned the Attempt, Due to Illness

Side and Front Views of an Agricultural Tractor That is Propelled by the Two Feet on Vertical Oscillating Levers, Plainly Seen Above: The Driver Operates the Tractor Either on Foot or in the Small Seat Seen beside Him

TRACTOR PROPELLED BY FEET FOR USE ON SOFT GROUND

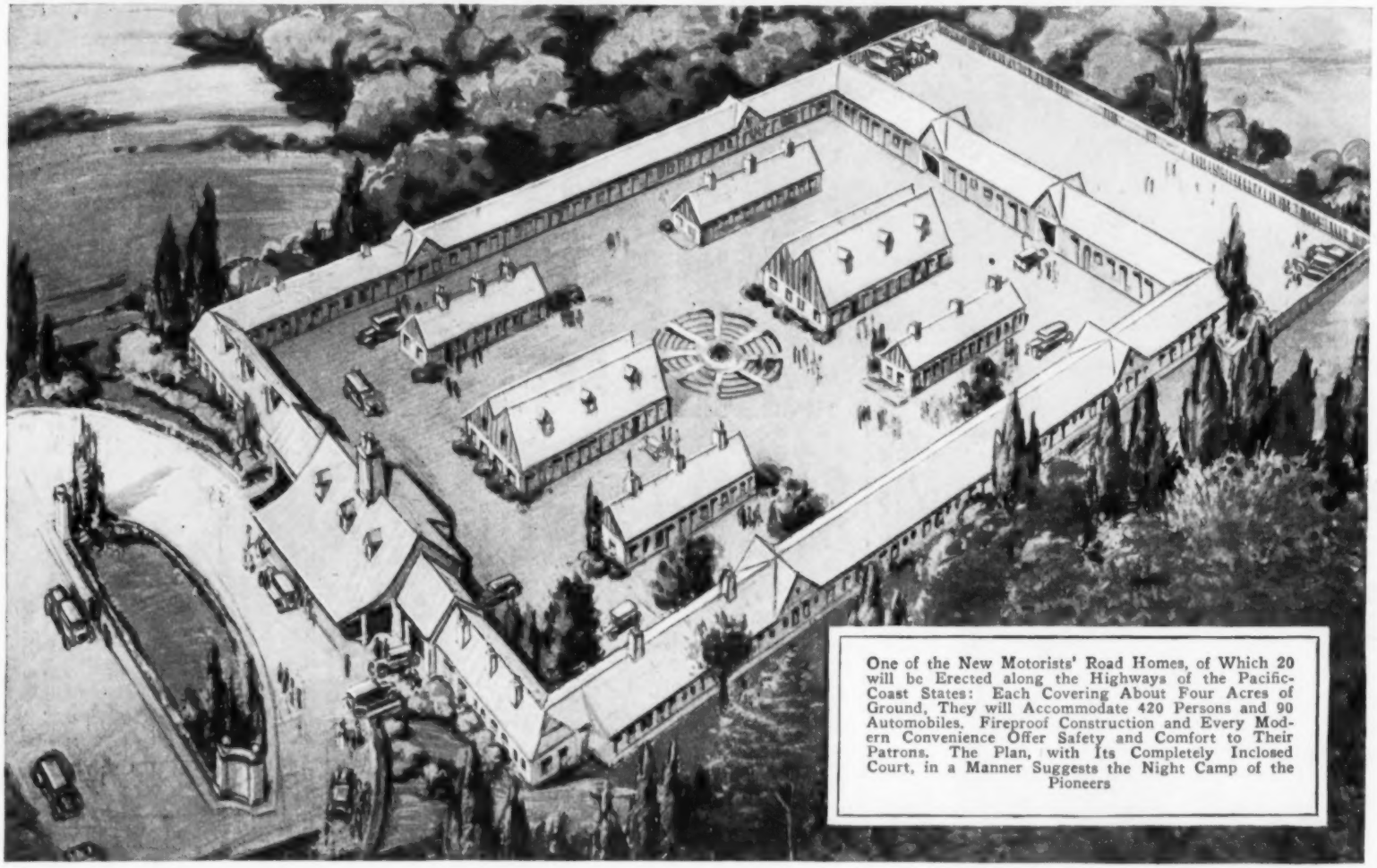
An agricultural tractor which is propelled by feet instead of by a wheel has been constructed in France. The purpose of the machine is to furnish a tractor that will operate equally well at all times on ground too soft or muddy for the effective use of propelling wheels. Mounted on a pair of steering wheels is a hood, with a radiator and power plant of automobile type. The sides and chassis of the hood are extended to the rear, and support two pivoted vertical levers, at the lower ends of which, in contact with the ground, are flat, horizontal propelling plates, or feet. By means of a system of connecting rods and cranks in connection with the motor, these levers are caused to move backward and forward alternately like the legs of any biped, and the propulsion of one foot continues until propulsion is started by the other. From the extreme rear of the machine, where there is a seat, the driver steers it, and at the same time overlooks the plow or other implement that may be hauled either by attaching it to the side or to the rear of the tractor.

NEW SWEDISH RADIO STATION TO BE AMERICAN-BUILT

Gradually the entire world is being equipped for radio intercommunication. The latest development in this connection is the award by the Swedish government of a contract to an American corporation for the erection of a new radio station near Gothenburg, on the west coast of Sweden, which will establish direct radio connection between that country and the United States. The contract calls for the installation of two 200-kilowatt alternator equipments, which will each deliver to the multiple-tuned aerial a current of 600 amperes. The entire plant will cost about $2,000,000, and will be very efficiently equipped.

DENTAL LIP PROTECTOR AIDS OPERATOR AND PATIENT

Specially adapted for use in all dental operations wherein it becomes necessary to distend and hold the corners of the mouth by means of a mouth mirror, a new device of this nature, which is also a lip protector, is held in place without any independent attachment. It is so shaped that it protects the inside of the cheek, and adds convenience to the dentist and comfort to the patient. It can easily be cleaned and rendered aseptic.



One of the New Motorists' Road Homes, of Which 20 will be Erected along the Highways of the Pacific-Coast States: Each Covering About Four Acres of Ground, They will Accommodate 420 Persons and 90 Automobiles. Fireproof Construction and Every Modern Convenience Offer Safety and Comfort to Their Patrons. The Plan, with Its Completely Inclosed Court, in a Manner Suggests the Night Camp of the Pioneers

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MOTORISTS' CARAVANSARY IS NEW INDUSTRY

By LAWRENCE WM. PEDROSE

ONE of the most interesting developments of modern times has been the automobile-tourist movement. Owing to the improvement of highways connecting East and West, North and South, the wide range of utility of the motor car, and the average American's love for the outdoors—adventure—hundreds of thousands of persons this year have, with comfort, spent the summer traveling about the United States in automobiles.

The motor tourist who spends months on the road, aimlessly covering thousands of miles, rubbing up against nature in the modern equivalent of pioneering, is a peculiarly American product. He is not migrating, he does not travel from the urge of "green fields far away," because he is not going anywhere in particular. He is not dissatisfied, restless. Most of the motor tourists are successful business men permanently located in the larger cities. They simply decide to take a long vacation, load the family into the automobile, and "hit the open road." Their prototype was the pioneer who crossed the plains in the days of the early West—they are pioneers in spirit if not in purpose.

In early days the stagecoach, the pony express, and the tavern or roadhouse were the vehicles and centers of progress and civilized activities. People congregated at the taverns to meet the traveler—their point of contact with the outside world. With the coming of the railroads this interest swung to the depots and hotel lobbies, bringing about the building of the present type of hotel. The automobile, and the coördinate stupendous highway development, in a few brief years have swung the pendulum back to the highways. Railroads are acutely feeling the change. Stage depots are appearing in almost every city, and the center of activity has shifted from the train depot to the motor station on the thoroughfares where auto busses roar up and away, full of twentieth-century pep and efficiency. Motor touring in recent years has increased about 50 per cent annually. Of the vast number of automobile tourists, many thousands are accustomed to the modern facilities and comforts of the city. The call of adventure is strong, but they cannot cast off their familiar environment overnight. It is they who fill the tourist camps provided by cities and towns along the highways of the country, where electric lights, fuel, water, and food can be purchased, and shelters and entertainment are also provided.

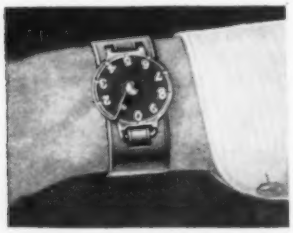
Map Showing Location of "Rodome" Stations, and Automobile Routes, along Pacific-Coast Unit of New Travel System

The latest development in providing attractive facilities for motor tourists is the "rodome," or huge tavern, 20 of which are to be built along the Pacific coast within the next few months. Construction of the first rodome, located at Sacramento, Calif., has already begun. The other 19 will extend from San Diego, Calif., to Vancouver, B. C.

The rodome accommodates 420 persons and 90 automobiles. It covers a tract of four acres. It offers a night-stopping place where travelers are socially and safely comfortable. It has such advantages as absolute privacy, fireproof building, reasonably priced accommodations, completely furnished apartments containing water, light, gas, with bath, toilet, and lavatory in every suite; garage adjoining each apartment, delicatessen and store carrying groceries, meats, vegetables, dairy products, newspapers and periodicals, ice cream, tobaccos, and auto accessories; complete auto-service station, community camp fire where travelers can meet and exchange experiences of the road, radio station, wash racks and pits for cleaning cars, and a staff of auto mechanics. Rooms are in singles, doubles, or suites; clean comfortable beds are provided with daily change of linen. Tenants may have a kitchenette or obtain their meals at a cafeteria. Clothing will be laundered for them, or they may launder their own.

GOLF-STROKE COUNTER WORN ON THE PLAYER'S WRIST

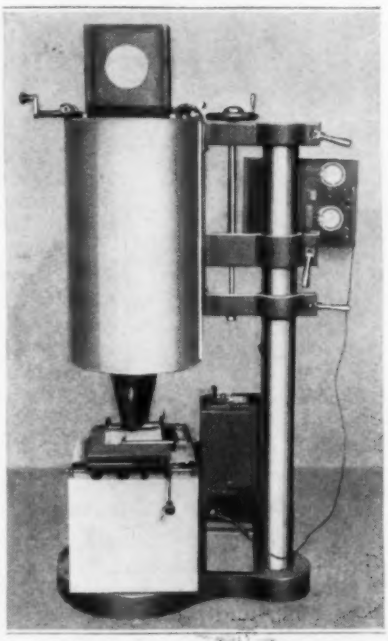
An instrument designed to keep an accurate account of the strokes made between holes, and worn like a wrist watch, is a novel appliance for the golf enthusiast. On the dial of the instrument is a small pointer which is moved after each stroke, and at each number makes an audible click indicating that the count is made. Its use is said to become quite automatic after the first round or two.



MONSTER MICROSCOPE TO AID IN DETECTING CRIMINALS

In order to facilitate investigations in connection with the identification of criminals, a western criminologist has had built a large high-powered microscope. Possessing all the features and detail of the smaller instrument, as well as some additional adjustments, this special microscope has a number of distinct advantages in studying finger prints, bloodstains, hairs and fibers, bullets, handwriting specimens, and other clews such as are used in the scientific detection of criminals.

One of the main features is the 10-inch-diameter eyepiece which permits five persons to view the specimen at the same time. This field of vision, combined with the unusual range and degree of magnification, which can be varied from two to 5,000 diameters, makes it possible to examine several objects in minute detail simultaneously. For instance, the similarity of two rifle bullets can be determined in a manner heretofore not available. In keeping with the general design are the arrangements provided for holding and manipulating the specimen. With a field, 18 inches square on the main stage, the object can be inspected over that area without having to shift its position on the stage, which can be moved in three directions by micrometer adjustments. As the stage and substage are some distance from the operator, these movements are regulated by controls conveniently located at the top of the barrel and connected to the mechanism of the stage by flexible shafting. By means of cross hairs in the tube, having a micrometer adjustment, together with the divisions on the operating controls, points on the specimen can be definitely located and noted. A finely graduated transparent scale at the eyepiece enables the observer to obtain any dimensions on the specimen. One-tenth of a turn on the most delicate control moves the specimen .0001 inch, which on the highest magnifications corresponds to a ½-inch movement of the image at the eyepiece.



This Microscope of Unusual Size and Power is Used in the Scientific Detection of Criminals

Supplementary features of the design are the arrangements made for illuminating the specimen. Underneath the substage is a box containing a 1,000-watt nitrogen-filled bulb with two 5-inch lenses for concentrating the light upon an opaque object, with which is also used a plate-glass reflector set at a 45° angle at the other end of the tube, for throwing the light back to the upper side of the object. For transparent specimens a special lens is used below the substage, the reflector being omitted. The attachment of a vertical projector above the eyepiece makes it possible for an assembly within a radius of 40 feet, to obtain a view of the enlarged image of a microphotographic specimen.

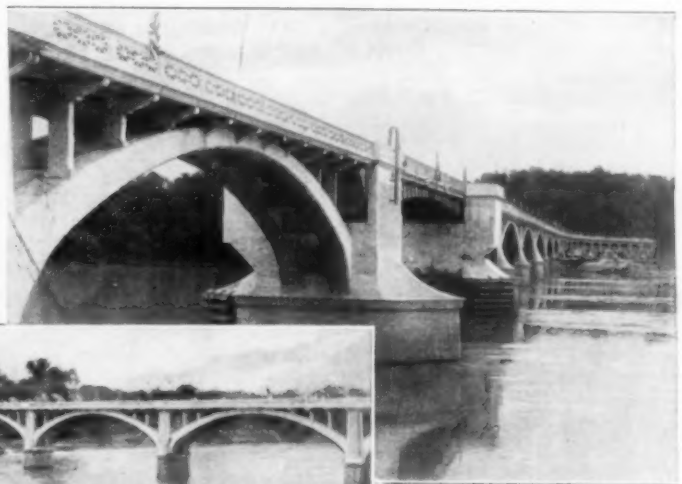
The minimizing of vibration due to the instrument's weight of 525 pounds, is an added advantage. Some idea of its size can be realized from the principal dimensions, for the height is 6 feet 4 inches, length of barrel 34 inches, and circumference of barrel 54 inches.

A SMALL FLYING BOAT RECENTLY TURNED OUT IN GERMANY

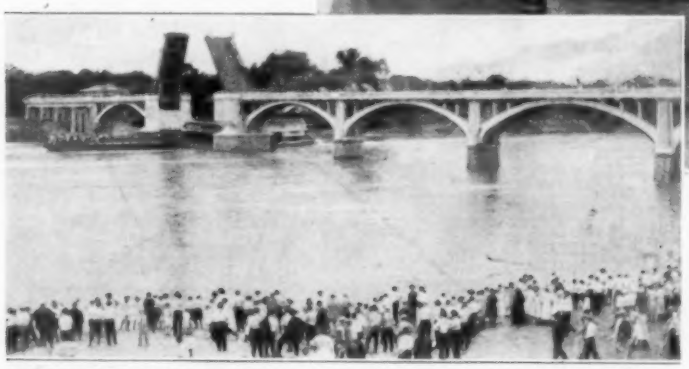
A SMALL flying boat, said to be the most efficient craft of its class yet evolved, represents the latest German development in this field. It is a monoplane type with a rotary motor and is of all-metal construction. This is one of the evidences of the great activity of the Germans in aviation, and indicates they do not intend to drop behind the rest of the world in building up their flying industry.

CONCRETE BRIDGE DEDICATED TO SERVICE MEN

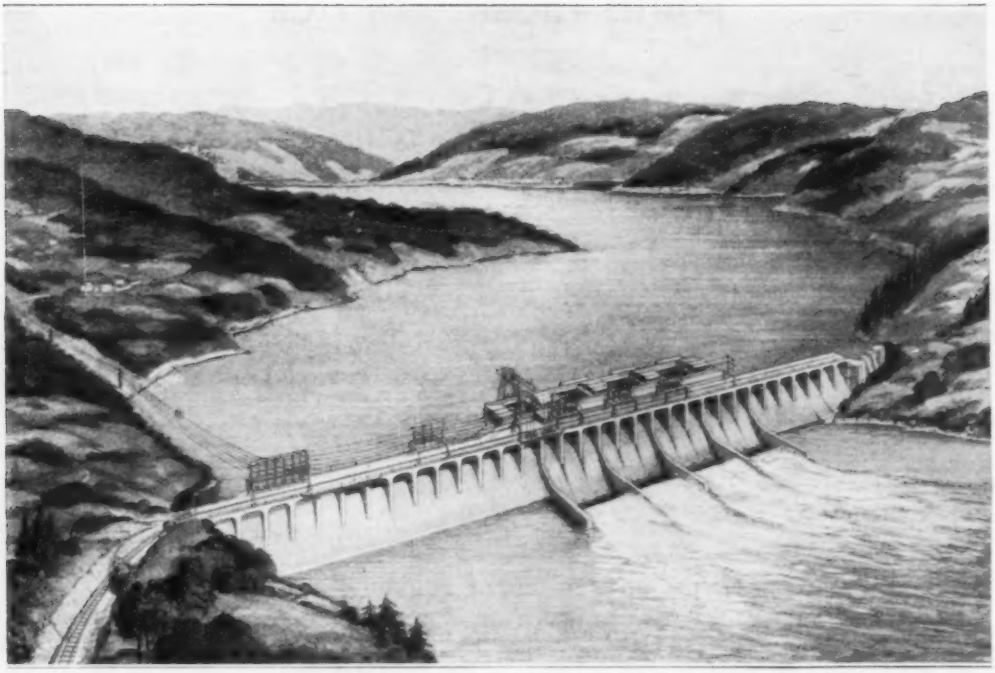
"Victory Bridge," a beautiful concrete structure over the Chattahoochee River at the town bearing the same name, has lately been completed and formally dedicated to the soldiers and sailors of Florida, who served in the late World War. The bridge is constructed entirely of reinforced concrete and has seven 110-foot arches, and one 100-foot bascule lift span across the channel, and cost approximately $1,000,000. The governor of the state officiated at the recent dedication ceremonies, which were witnessed by an estimated crowd of 10,000 people.



Beautiful Concrete Bridge Which was Recently Completed and Formally Dedicated to the Soldiers and Sailors of Florida in the Late War



Another View of the Bridge, Showing Many People Watching the Bascule Lift Span being Operated, 15 Minutes After the Dedication Ceremonies were Finished, and the First Boat Going Through

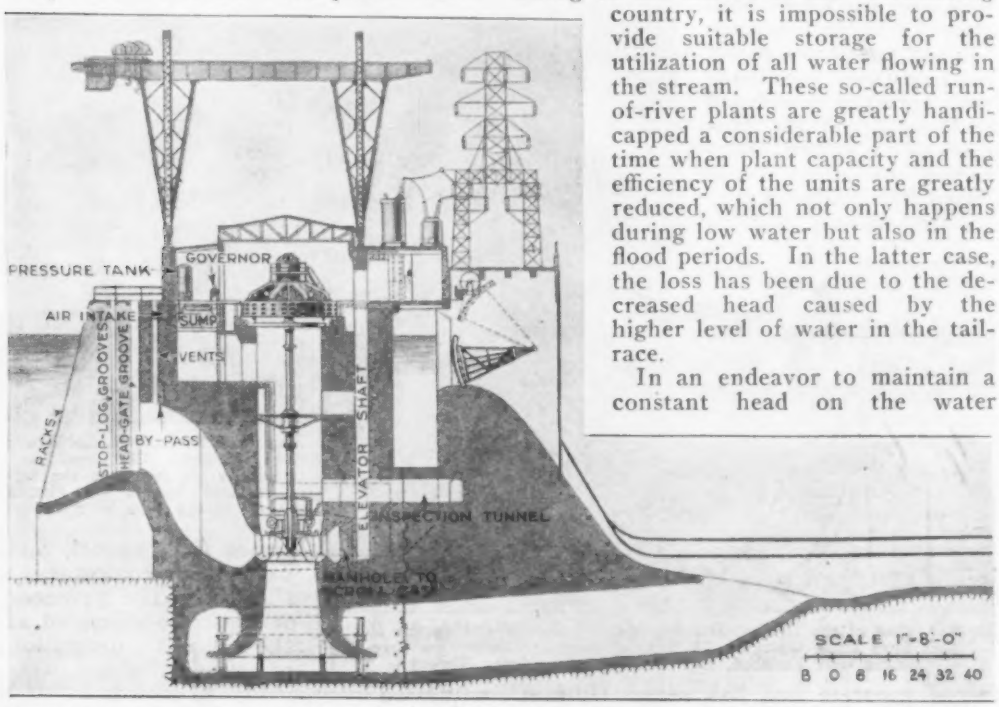


View of Water-Power Development, Showing the Storage Reservoir on the Upstream Side of the Dam and, on the Downstream Side, the Water Running through the Spillways and Backwater Suppressor: Note the Power House Located at the Middle of the Dam

NEW DESIGN INCREASES POWER-PLANT EFFICIENCY

THERE are many power plants and possible sites for such plants where the supply of water is very irregular, and owing to the nature of the surrounding country, it is impossible to provide suitable storage for the utilization of all water flowing in the stream. These so-called run-of-river plants are greatly handicapped a considerable part of the time when plant capacity and the efficiency of the units are greatly reduced, which not only happens during low water but also in the flood periods. In the latter case, the loss has been due to the decreased head caused by the higher level of water in the tail-race.

In an endeavor to maintain a constant head on the water



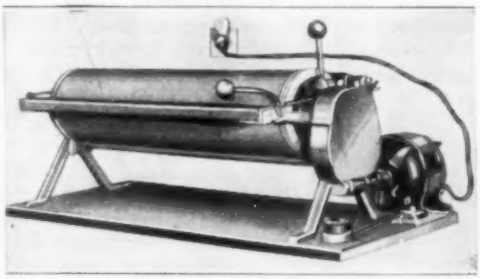
Cross Section through Dam and Power House, Showing Arrangement of Vertical Water-Wheel Generators: The Backwater Suppression Results from the Scientific Design of the Downstream Face of the Dam

wheels, a design, called a backwater suppressor, has been developed to remove the high tail water, utilizing the waste water coming through the spillway of the dam for this purpose. In a properly built dam, the water flows over the downstream face in a thin sheet and leaves it at a high velocity, forming at some distance farther on a standing wave or backroll. This energy, heretofore wasted, has been directed toward removing the backwater from over the outlets of the water wheels.

In addition to the increased operating efficiency obtained, careful estimates have indicated that water-power plants designed on the backwater-suppressor principle, can be built at less cost than the conventional types now in use.

"IRONING DAY" A PLEASURE WITH ELECTRIC IRONER

"Ironing day," that day of drudgery for the housewife, can now be relegated to the past as far as the drudgery is concerned, if a recently introduced electric ironer is used. The appliance weighs only 65 pounds, occupies a space 3 feet long by 15 inches wide, irons everything in the family wash, and is so simple that



Electric Ironer, Showing the Driving Motor with Switch, and How the Outfit is Connected to Any Wall Plug

it can be operated by a child. It is so constructed that garments going through it cannot be caught or torn.

GAS-FIRED BENCH FURNACE HAS MANY USES

A gas-heated bench furnace of convenient design, has recently been placed on the market. A 20-pound capacity lead-melting pot may be heated by removing a lid from the top, while long rods or pipe can be inserted through an opening in the side, and soldering irons or small pieces can be heated at the front opening. The furnace accommodates a pair of 14-pound soldering irons or two pairs of 4-pound irons. It is equipped with three very satisfactory Bunsen burners, which will maintain a temperature of 1,800° F., without resorting to preheated gas or the use of a blower or compressed air for blast. In a recent test, it was found that 20 pounds of lead were melted in 10 minutes, with gas consumption at the rate of 40 cubic feet per hour.

Above: Gas-Heated Bench Furnace with Melting Pot in Place. Below: Showing How Gas and Air are Mixed in Burner

ELEVEN DIFFERENT GRIPS IN SOCKET WRENCH

Practically every nut and bolt on a small motor car of well-known make can be gripped in one or another of the 11 different-sized openings of a lately introduced socket wrench. The tool is 9½ inches in length, weighs 1½ pounds, is made of metal carefully annealed to give

Socket Wrench Having 11 Different Grips Which will Fit Practically Every Nut and Bolt on Well-Known Small Car

strength, and should prove a valuable addition to the repair kit for this type of machine.

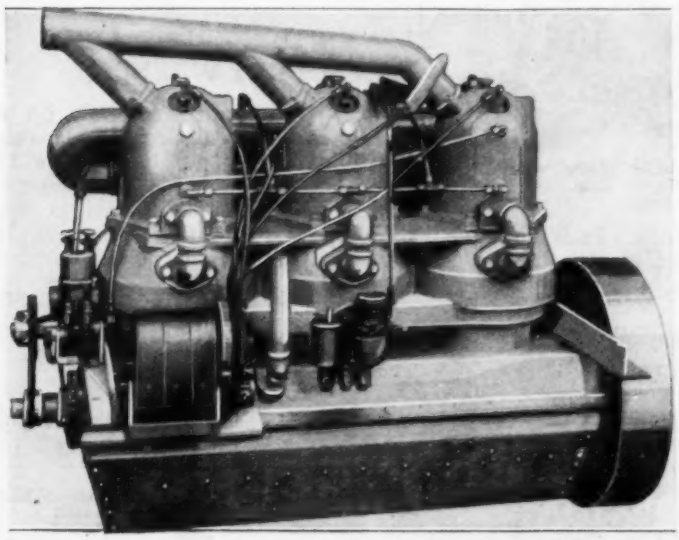
PLAN REBUILT BROOKLYN BRIDGE AS CABLES SHIFT

It was recently noticed that, of the four main cables supporting the Brooklyn Bridge, the two north cables had slipped in their saddles. In the case of the north cable the movement was 1½ inches in the direction from the shore span to the main span, and for the next cable ½ inch in the same direction. No other change of condition in the bridge had been observed in the regular inspections, nor was any detected in a special examination, so this is regarded only as a readjustment of strains arising from a similar movement of the south cables in 1898, when trolley cars were first operated across the bridge. In addition to the rebuilding of this 40-year-old structure, plans are considered to span the river, near by, with a new bridge in order to meet the steadily increasing traffic demands at that point. Traffic diverted to the new bridge, when finished, will permit rebuilding the old one.

View of Brooklyn Bridge, Showing One of the Main Piers with Two of the Suspension Cables and Network of Smaller Cables Supporting the Decks

TWO-CYCLE ENGINE WITH AUXILIARY CYLINDERS

A two-cycle engine which has an auxiliary piston and cylinder in which the preliminary compression is done instead of in the crankcase, has been demonstrated, it is said, with perfectly satisfactory results in Portland, Ore. The auxiliary cylinder is connected to the lower end of an ordinary two-cycle cylinder, which for a considerable length below its intake and exhaust ports has its wall finished inside to fit the two-cycle piston at the end of its outstroke, and outside to fit the auxiliary piston at the end of its instroke. This auxiliary piston, U-shaped in section, is bored to fit this finished part of the two-cycle cylinder, and has its outside wall finished to fit the bore of the auxiliary cylinder, leaving a concentric space between the piston and the auxiliary cylinder head, where the charge is sucked in and partially compressed. The power piston and its connecting rod drive the shaft with one crank, and two other cranks at 180° with suitable connecting rods operate the auxiliary piston.

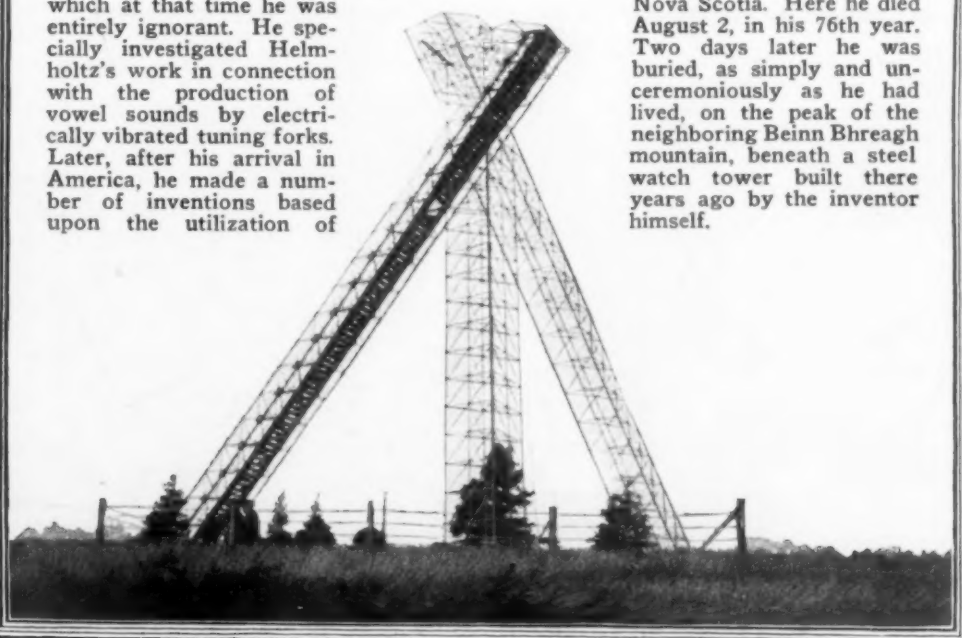


New Type of Two-Cycle Engine Built with Three Cylinders for Automotive Work: Intake of the Charge and Preliminary Compression are Done in the Lower Part of Each Double Cylinder, Which Work is Normally Performed in the Two-Cycle Crankcase

DEATH OF ALEXANDER GRAHAM BELL

AMONG stories of invention none is more romantic than that of the telephone and its creator, Alexander Graham Bell. Both his grandfather, in London, England, and his father, in Edinburgh, Scotland, were lifelong experts and teachers of the mechanism of speech, and in time this became a family profession. Alexander Graham himself, early in life, took up the study of vibrations. First later on came the study of electricity, of which at that time he was entirely ignorant. He specially investigated Helmholtz's work in connection with the production of vowel sounds by electrically vibrated tuning forks. Later, after his arrival in America, he made a number of inventions based upon the utilization of musical notes as telegraphic signals, and these led gradually to the perfecting of the telephone itself. This made him a world-wide celebrity. His bearded face became the subject of countless reproductions, none more faithful than in a bust for which he posed to the famous sculptor Moses Dykaar.

For many years the great inventor had made his summer home near the village of Baddeck, in Nova Scotia. Here he died August 2, in his 76th year. Two days later he was buried, as simply and unceremoniously as he had lived, on the peak of the neighboring Beinn Bhreagh mountain, beneath a steel watch tower built there years ago by the inventor himself.



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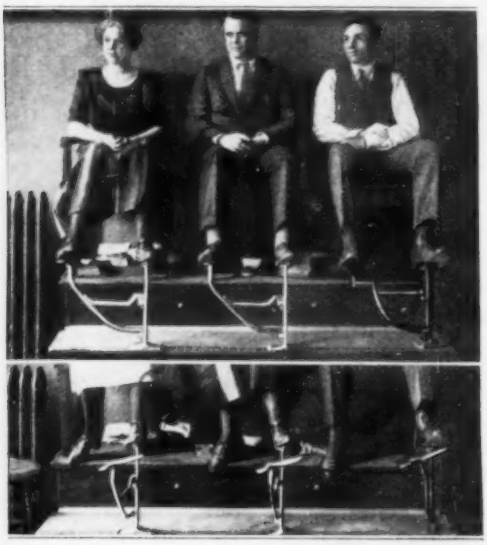
FOOTREST FOR SHOE SHINING SWINGS OUT OF THE WAY

By adopting swinging footrests, the owner of a western shoe-shining parlor has made it possible for his patrons to have a clear passageway when mounting or leaving the stand. Only one of each pair of footrests swings, being supported by a bracket hinged to the other. The innovation is particularly pleasing to women because their skirts are less likely to be caught in one or the other of the footrests.

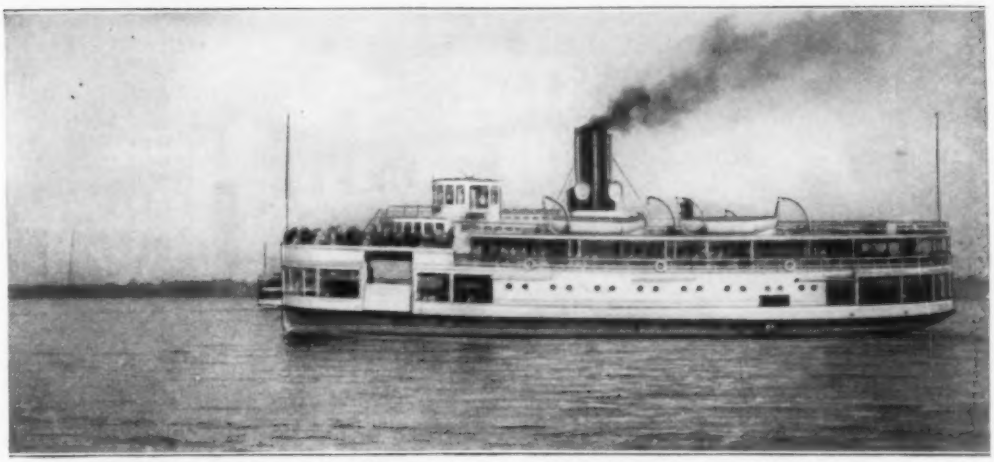


Above: The Footrests in Place. Below, They are Shown Swung Out of the Way, Allowing the Patrons a Clear Passage

OREGON LUMBER CAMP BOASTS LONGEST RADIO ANTENNA

What is claimed to be the longest privately owned straight-line radio antenna in the world has been erected at a lumber camp in the state of Oregon. When it was decided to install a radio outfit, all the available standing timber had been removed for some distance from around the camp site, and the nearest suitable tree stood 1,015 feet away, with its lowest branches 150 feet above the ground and its top 300 feet in the air. In spite of the apparent difficulty, the lumberjacks were undaunted, and one of them volunteered to climb the tree, making fast, 200 feet above the ground, the end of the long copper wire that was stretched to the radio house. The climber wore scaling spurs and worked his way up, assisted by short ropes around the big trunk. This radio installation is said to be one of many that are now being put in at the large lumber camps of the Northwest, so that the hitherto isolated workers may have daily contact with the news and enjoy some of the entertainments of the outside world.

View of Western Lumber Camp Where a Single-Wire Antenna, 1,015 Feet Long, was Erected in Connection with a Radio Outfit Installed for the Entertainment of the Somewhat Isolated Inhabitants



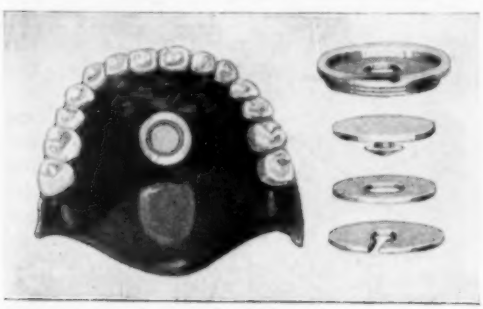
New Combined Passenger and Automobile Boat Put into Service as a Ferry between Detroit and Windsor: It Is 170 Feet Long, 66 Feet Wide, and Accommodates 2,000 Passengers and 60 Automobiles. It Is Also an Ice Breaker

PASSENGER AND AUTO FERRY ON THE DETROIT RIVER

To accommodate the heavy traffic between Detroit, Mich., and Windsor, Ont., a very large combined passenger and automobile ferry, named "La Salle," was put into service recently. The boat is 170 feet long, 66 feet wide, drawing 14 feet of water, with a net tonnage of 334. The automobile deck accommodates 60 cars lined up three abreast. One of the advantages of the boat is the short time it takes to bring aboard and unload the automobiles. The passenger capacity is 2,000. The big ferry is also an ice breaker, which is an unusual feature in a ferry of this size.

DENTAL-PLATE SUCTION VALVE FOR MAINTAINING VACUUM

Many persons who are forced to wear a set of artificial upper teeth know the annoyance caused by the plate not holding firmly against the roof of the mouth, but do not know the reason for its dropping away. It is the vacuum between the plate and the roof of the mouth that holds the plate in place, and to help maintain this vacuum, a suction valve has been devised which is placed in the forward center of the plate. This valve opens by suction against it, and closes mechanically, and is claimed to hold the plate quite firmly against the roof of the mouth.

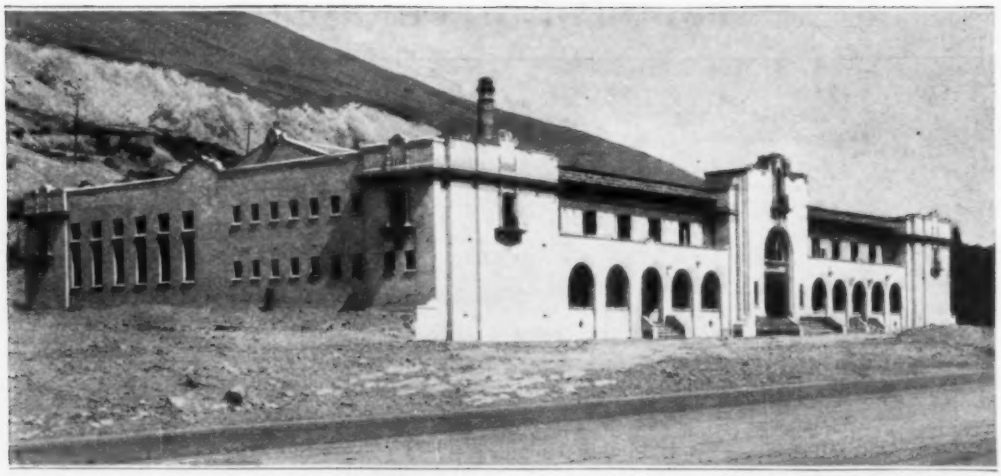


The Suction Valve can be Seen near the Center of the Plate. To the Right Are the Various Parts of the Valve

HEAVILY LOADED SUITCASE SHOWS GREAT STRENGTH

More than 2,000 pounds were loaded on a special platform and placed on top of a new steel-bound suitcase in an effort to determine just how much weight the case would withstand. The handle and two outside straps are of leather. It is designed for automobile and other travel, where it may be exposed to rough handling.

The Combined Weight of the Sacks Shown Above Is 2,100 Pounds. They were Loaded on This New Steel-Bound Suitcase in a Test to Determine Its Strength

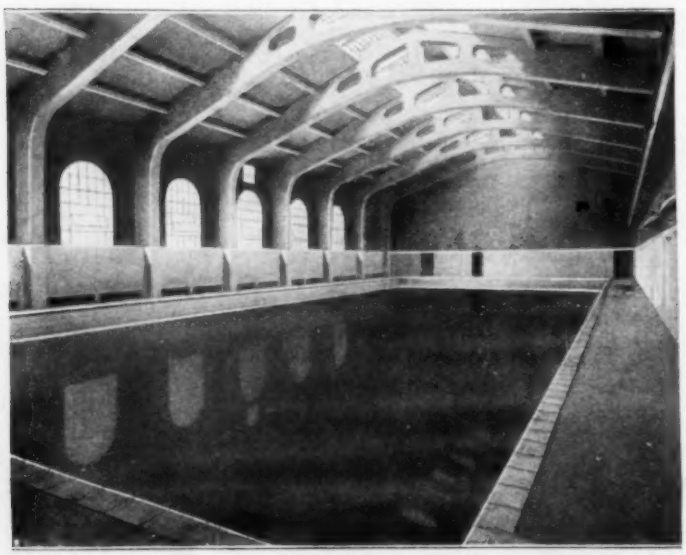


Municipal Bathhouse at Salt Lake City, Which is Supplied with Natural Hot-Spring Water: It Contains Locker and Dressing-Room Accommodations for Over 1,200 Persons, and Has a Completely Equipped Modern Laundry for the Sterilization of Bathing Costumes

HOT-SPRING BATHHOUSE FOR SALT LAKE CITY

By GEORGE F. PAUL

SALT LAKE CITY has at last made a reality out of what for years was but a dream. Now the western city has a $330,000 bathhouse, which will provide her own people and her visitors with natural hot-water bathing and swimming. It contains a magnificent common pool, 120 by 50 feet in dimensions, a medium-sized pool for private parties, seven small pools for individual use, and complete equipment for accommodating the patrons. The city commissioners, in considering plans for the building, decided upon a structure of the Spanish renaissance type, one that would have both airy grace and restful dignity. Furthermore, the building was constructed to make the best possible use of the natural hot waters. In 1920, there were 133,000 bathers at the old springs. It is believed that the annual attendance at the new bathhouse will reach the 300,000 mark.



Interior of Municipal Bathhouse, Showing the Main Swimming Pool, Which Is 120 Feet Long by 50 Feet Wide: There Are Also Several Smaller Pools for Physical Exercises

Locker and dressing-room accommodations are provided for 440 men, 600 boys, 250 women, and 100 users of the private pools. There is a completely equipped laundry, which turns out 400 sterilized and dried suits every hour. It is believed that the institution will pay for itself within six years. The charges will probably be 25 cents for the main plunge, and 50 cents and $1.00 for the individual pools.

Much has been done to provide for the comfort and convenience of the patrons. The southern part of the main floor is equipped with a three-chair barber shop, a massage room with Turkish baths, and a special room for the men.

The women patrons will find a beauty parlor, a restroom, and quarters for a masseuse. For emergency cases, a pulmotor and other resuscitation apparatus have been provided. A completely equipped café will furnish the food for those who take the baths under the direction of a physician.

The waters are limpid and smell strongly of sulphureted hydrogen, and issue from the mountainside in a strong stream, at a temperature of 95 to 104° F. The people of Salt Lake City look upon this new building as a health investment. They feel that it will also be an added attraction for visitors to their city.

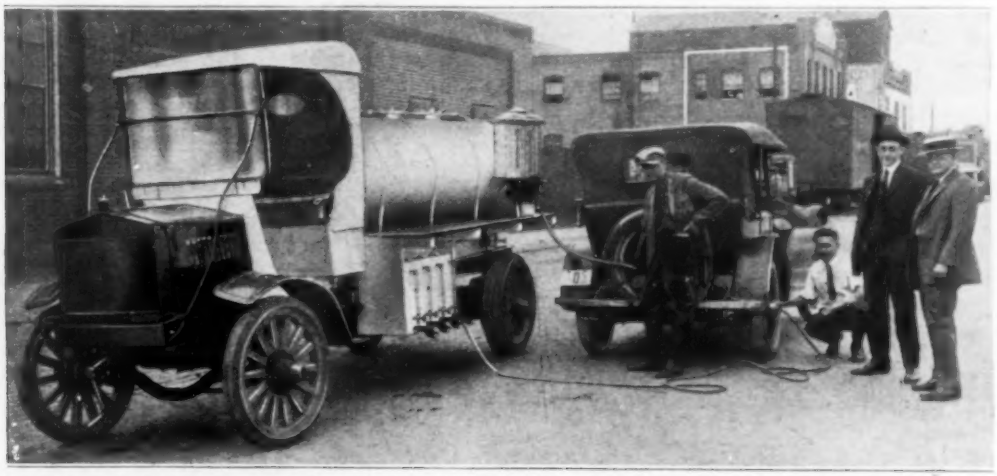
GAS, OIL, AND AIR DELIVERED FROM HOUSE TO HOUSE

Delivering gasoline, oil, and air from door to door, is the latest activity of a filling station in Denver, Colo., and has proved very popular. The vehicle used for the work is equipped with a 750-gallon gasoline tank, a 60-gallon tank for lubricating oil, a heavy-duty air compressor with a tank having a capacity of 160 pounds, all of which are mounted on the chassis of a two-ton motor truck. A complete line of accessories for emergency needs is also carried, it being the owner's intention to travel a regular route over the adjacent highways, dispensing general "first aid" during the summer months, while in the winter, a house-to-house service will be maintained. Judging from the popularity gained by the service, it is probable that other trucks will be similarly equipped.

TOOL-HOLDING ATTACHMENT FOR GRINDING MACHINES

A new tool-holding attachment for use in connection with grinding machines is on the market. It may be built in as part of the grinder or made to attach to the standard emery-wheel stand. The holder consists of a bracket carrying a vertically adjustable post, which in turn supports an adjustable horizontal bar, to the overhanging end of which is fitted the block for holding the tool to be ground. This block is adjustable to any desired angle.

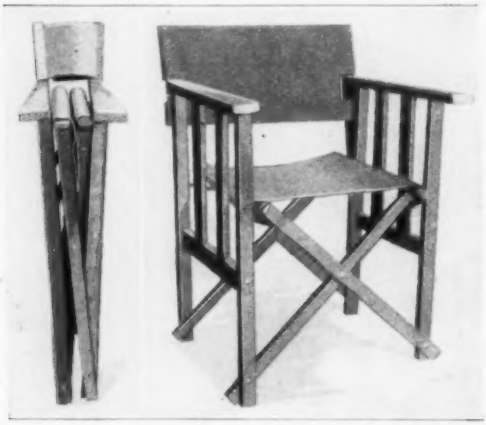
Tool-Holding Attachment as Applied to Emery-Wheel Grinder, Showing the Holder in Use for Accurately Grinding the Steel Die Chasers Used in Many of the Modern Threading Tools



This Traveling Filling Station, Which Delivers Gasoline, Oil, and Air from House to House, or Dispenses Them on the Highways, is Here Shown Inflating the Tires of, and Also Supplying Gasoline to, a Passenger Car Encountered on One of the Streets of the City

FOLDING CHAIRS OR ROCKERS COMFORTABLE AND COOL

Folding chairs or rockers, which are comfortable and cool during the hot summer months, are now being manufactured and placed on the market by an eastern concern. The chairs are simple to fold or open, weigh only 12 to 15 pounds, and are therefore easy to handle, in addition to which they have a flexible "floating" canvas seat, thus providing the greatest of comfort to the user.



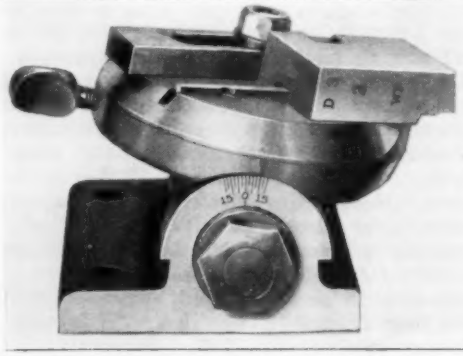
At the Left the Chair is Seen Folded as a Means of Saving Space, and at the Right Ready for Use

PACKING CASE OF MOTOR CAR CAN BE USED AS GARAGE

That the packing case in which a small motor car of new design is shipped from the factory, can be used as a garage for it, is claimed by its manufacturer. The little automobile is interesting in many other respects. It has a two-cylinder, four-cycle V-type motor, disk wheels with 26 by 3-inch demountable tires, sliding gear with three speeds forward and reverse, multiple-disk clutch, high-tension magneto, generator or battery lighting, the pedal arrangements and gear shifts being similar to those on an ordinary automobile. From 60 to 75 miles can be traveled on one gallon of gasoline, it is stated, and two persons can easily lift the diminutive machine.

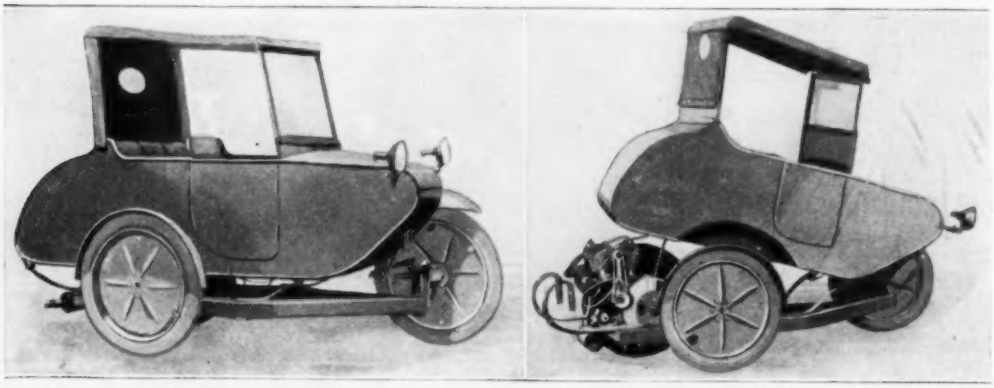
CHAMFER-GRINDING FIXTURE FOR THREAD CHASERS

For grinding chamfers on thread chasers, a fixture has been devised that insures an exact chamfer ground equally on all the chasers of a set. The table of the chamfer-grinding fixture is graduated, and may be set for grinding long or short chamfers. An adjustable stop, which may be locked, regulates the position of the chaser in relation to the grinding wheel.

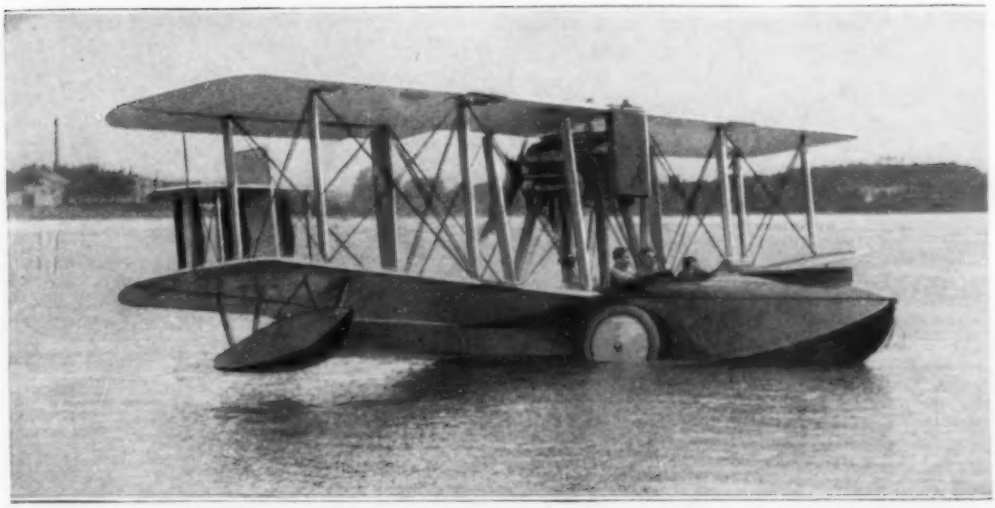


Chamfer-Grinding Fixture with a Thread Chaser in Position Ready for Grinding: When in Use, the Fixture is Bolted to the Grinder Table

The side of the fixture is graduated for tilting the table to the desired angle of chamfer clearance.



The Newly Designed Diminutive Motor Car, the Shipping Case of Which may be Used as a Garage: At the Right the Machine is Shown with the Body Elevated, So That the Engine Is Easily Accessible for Repairs



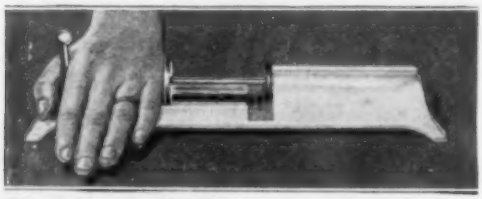
New Flying Boat Built for the Air Service of the United States Navy: Note the Wheels, Drawn Up against the Hull, Which Enable the Craft to Land on the Ground

U. S. NAVY IS DEVELOPING LAND AND SEAPLANE

A new airplane built for naval air service has the usual hull and pontoons of the flying boat for alighting on water, and the landing gear, with wheels that slide up alongside the hull, for landing on a firm surface like the deck of a warship or an open field. This is understood to be the forerunner of a more fully developed type for extended use in naval service. The activities of our own government and those of foreign nations, indicate the importance expected of air craft in future wars.

GLOVE SIZER TAKES PLACE OF TAPE MEASURE

Glove fitting is usually done with the aid of a tape measure, but a sizer, recently introduced, does away with this custom. In using the new appliance, the hand is placed, palm down, on a base which contains a scale and a spring

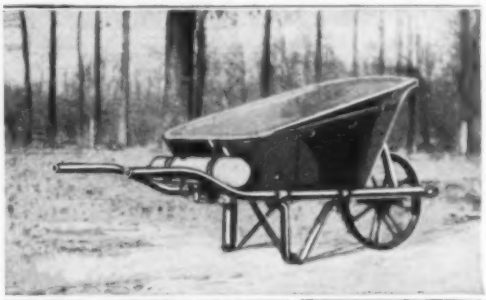


Glove Sizer, Showing How the Hand is Placed on the Aluminum Base with the Plunger against It

plunger which pushes tightly against the hand, and thus automatically shows its width, or the size of glove required.

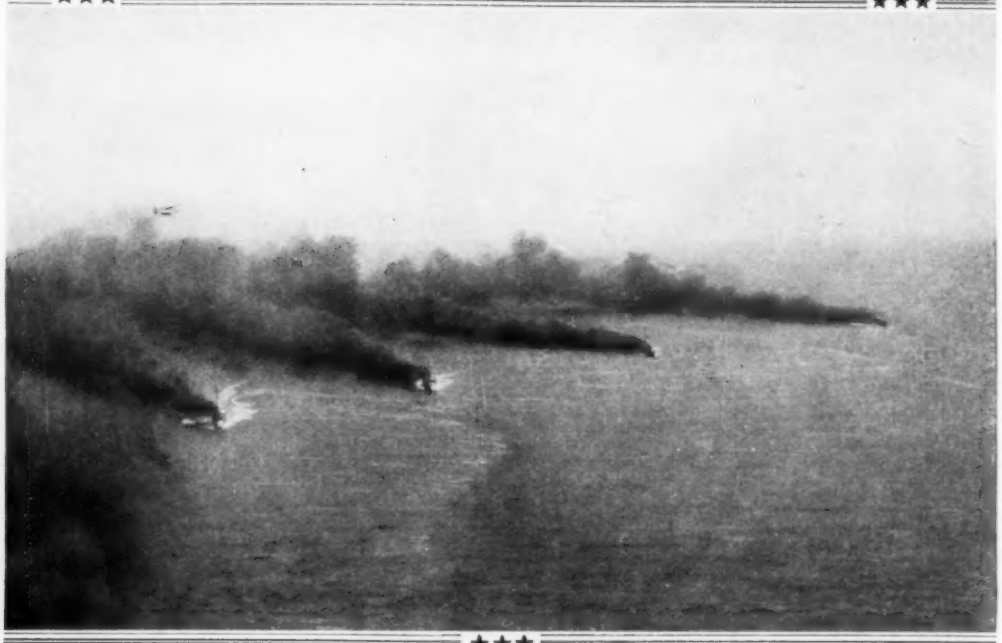
WHEELBARROW HEATER MADE FOR REPAIRING ROADS

Heating a wheelbarrow with a gasoline burner so as to facilitate the repairing of roads, is the idea of an eastern equipment

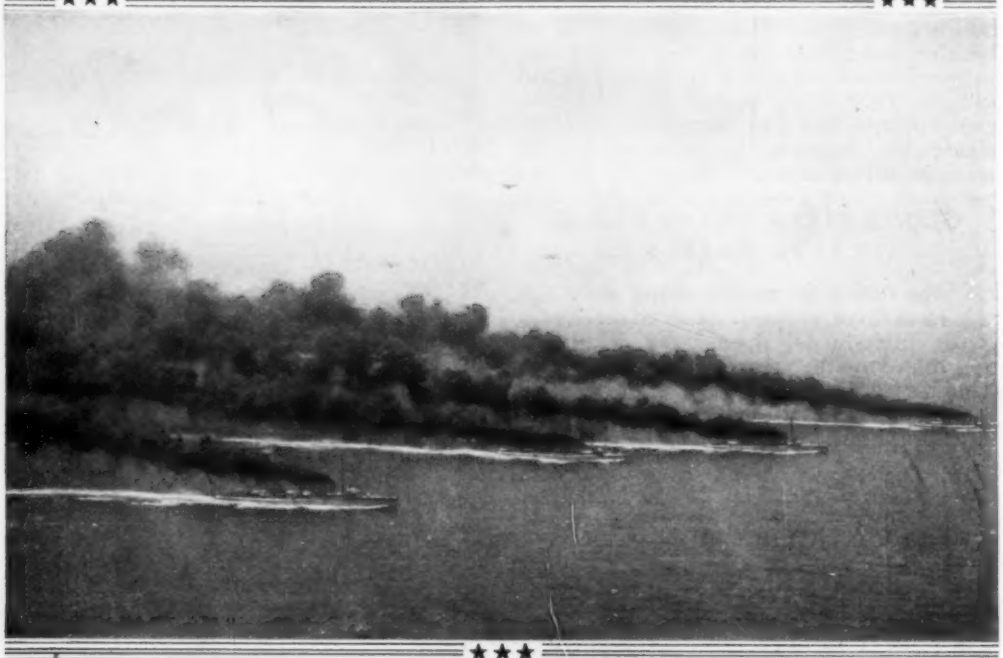


Above: Wheelbarrow Which Has a Gasoline Heater Incorporated in It for Facilitating Road Repairs. Below: Interior, Showing Road Material being Heated. The Fuel Tank is Seen between the Handles

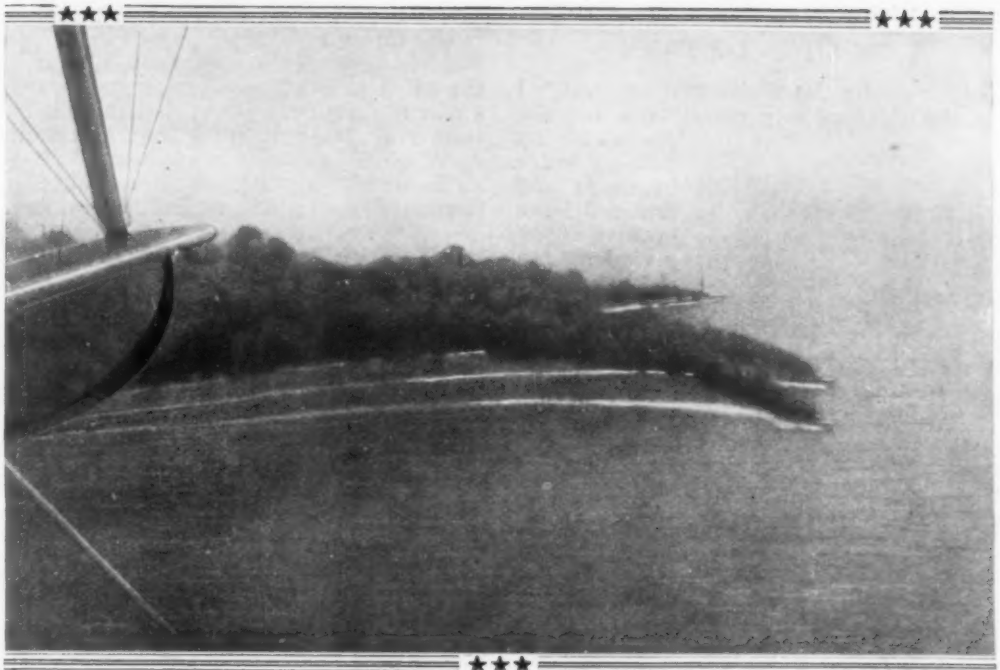
company, which has lately introduced a conveyance of this description. The heating apparatus operates on the same principle as the ordinary gasoline blowtorch used by mechanics, and has a two-gallon tank. The outfit is incorporated in the construction of the wheelbarrow in such a manner that the contents can be continually kept in a melted state.



NAVAL officers are devoting much time these days to the development of effective tactics in the formation of smoke screens, so indispensable in both offensive and defensive naval warfare. As a first step in such tactics, destroyers move abreast at high speed, as seen above. They continue their rapid forward movement for the purpose of developing the required density of smoke, which is induced by cutting off the air from some of the oil burners in the boilers. This causes unconsumed oil to issue in clouds from the smokestacks. When the smoke is sufficiently dense, and is hanging in heavy clouds over the



FOR THE FORMATION OF SMOKE SCREENS

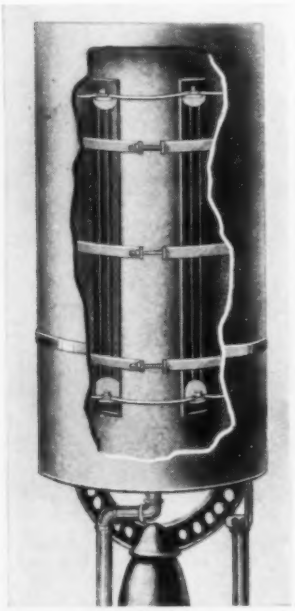


water—sometimes with a height of as much as 800 feet—the destroyers begin to move into echelon formation. This is the beginning of the object of the whole operation, which is to surround one or more battleships with a smoke screen that renders them invisible to the enemy. The maneuvers of the

destroyers are partly directed by signals from airplanes or dirigibles. The smoke clouds may also be used by the destroyers to screen themselves from the enemy while preparing to fire torpedoes. The maneuvers depicted in these photographs were performed recently off San Diego, Calif., by the Pacific fleet.

ELECTRIC HEATERS STRAPPED ON SIDES OF TANK

Electrical units which can be strapped to the sides of any metal tank for the purpose of heating water in shops and homes, have lately been placed on the market. The heaters, which are of simple construction, are fastened by means of three adjustable steel bands, tightly against the lower half of the tank. The appliances are claimed to be entirely satisfactory for conditions not requiring a temperature to exceed 300° F., and are easily removed for repairs or installation in other locations.

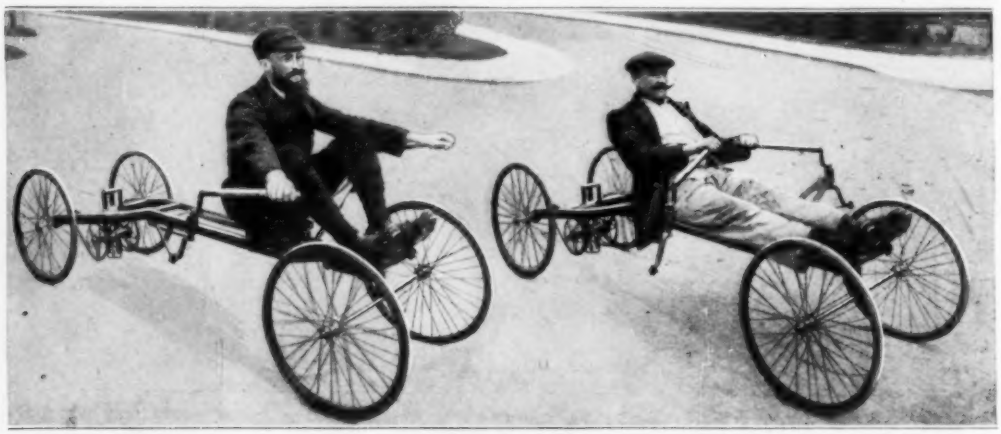


FOUR-WHEELED AUTO CYCLE PROPELLED LIKE A BOAT

A four-wheeled man-propelled vehicle that is driven with the same movements as in rowing a boat, has recently been tested with success at Lyons, France. The driver sits on a sliding seat facing in the direction of travel, and moves two handles backward and forward in exactly the same manner as a boatman operates a pair of sculls, excepting that there is no feathering movement. The maximum speed of this rowing auto is over 18 miles an hour. Besides its use as a vehicle, it furnishes an excellent means for training.

IMPROVED BOTTLE CROWNER OPERATED BY HAND

A bottle crowner, operated by hand, that will give the results obtained by much more elaborate commercial bottlers, has been recently placed on the market. The hand crowner has a plunger backed by a heavy spring, that supplies the necessary pressure on the cork lining of the crown, before its skirt is crimped to the bottle. The table of the machine can be adjusted to suit bottles from 7 to 12 inches in height, and a push down on a handle completes the crowning. A pressure of approximately 300 pounds is applied before crimping.



Four-Wheeled Auto Cycle That is Propelled with the Same Movements as in Operating a Pair of Sculls in a Boat with a Sliding Seat: The Left-Hand View Shows the Beginning of the Power Stroke, and the Right-Hand View the End of It

STAR ISLAND DEDICATED EXCLUSIVELY TO RELIGION

STAR ISLAND, one of the Isles of Shoals, 10 miles off the mainland of New Hampshire, has been dedicated exclusively to religious service for 120 years. On its rocky summit is a small gray-stone church which was built in the year 1800. This has been used ever since as a place of worship, first by fishermen's mothers, sisters, and sweethearts who prayed for the safe return of their loved ones. During the last 26 years, it has been a shrine for Unitarians and Congregationalists. At 10 o'clock each night, long lines of men and women, carrying small lanterns, wend their way thither and, a churchful at a time, hang their lanterns on the walls, and bow their heads in prayer or raise their voices in appropriate hymns.

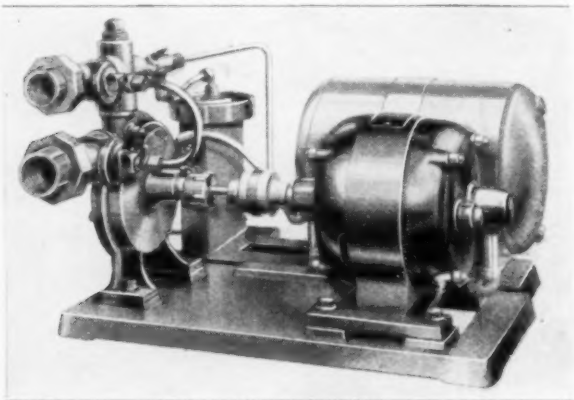
AUTOMOBILE STOP SIGNAL ENTIRELY AUTOMATIC

An automobile stop signal has been devised that is absolutely automatic, being actuated exclusively by the effect of arrested momentum. The signal flashes, independently of anything else, by any slowing down of the car. The current is automatically cut off and the light disappears when the car comes to a stop, or at the instant it picks up speed or discontinues the slowing-down movement. In appearance and location at the rear of the car, it is much like any other stop signal, its novel use of the action of arrested momentum being its distinguishing feature. Being operated in this manner, it is exceptionally durable.

Automobile Stop Signal That Flashes Its Light Automatically and Exclusively by Any Retardation, Great or Small, in the Speed of the Car

AUTOMATIC PUMPING PLANT FOR HOUSEHOLD USE

For use in isolated dwellings, a compact pumping unit is being manufactured that is so arranged that the objectionable storage tank is entirely eliminated. The pump is driven by a small electric motor, and the entire unit, including the control apparatus, is mounted on a small cast-iron base. The operation of the pump is controlled by the pressure in the water mains. As soon as a faucet is opened, the motor starts running, and continues until the faucet is closed. The pump is capable of drawing water from a depth of 22 feet and supplies water to the mains at 45 pounds' pressure. At this pressure, the water can be discharged at a height of 90 feet.



This Household Pumping Unit Operates Automatically: When a Faucet is Opened, the Motor Starts and Runs until the Faucet is Closed

RECENT RAILROAD EXTENSION IN EAST CENTRAL AFRICA

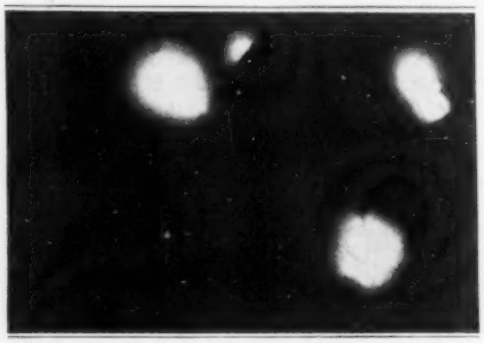
The opening recently of the Trans-Zambesia Railway marks an important stage in the development of Nyasaland, the British central-African protectorate. Nyasaland has for some time possessed a railway which connects Blantyre, the capital, with a point on the Zambesi River, and this is to be extended to Fort Johnston, at the southern end of Lake Nyasa, whence water transport is now available for 360 miles northward. The new railway connects with the old one at the Zambesi, and runs southward to the port of Beira on the Indian Ocean. The river will later be bridged, but for the present the two lines are connected by a ferry. The newly built railroad is 157 miles long.

RECONSTRUCTION HOSPITAL TO BE ENLARGED

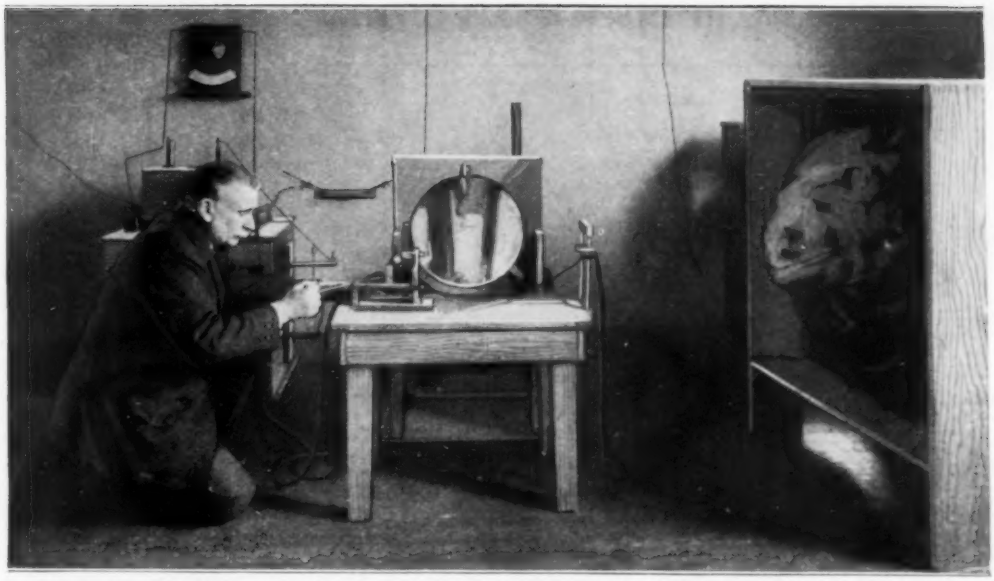
The Reconstruction Hospital of New York, which for some time has been devoted to the care of industrial-accident and disease cases, has seen its work so greatly increased this year, that an 11-story addition to the institution is contemplated. Patients from more than 30 states and of almost every trade have here been refitted for work, mainly by means of "mechanotherapy," as the system of treatment is called, administered in a specially equipped gymnasium. Unlike the ordinary gymnasium, which is equipped to make normal and healthy muscles stronger, that of the hospital is designed for crippled muscles, stiffened fingers, diseased joints, and particularly for their mental effect. Every exercise is prescribed by physicians, and an expert supervises the work of re-educating the injured members. The successful operation of the hospital has led the government officials to advocate similar institutions in other centers of industry.

LIGHTNING BUG'S "FLASHES" ON PHOTOGRAPHIC PLATE

Photographing the "flashes" of a lightning bug was accomplished recently, when one of these insects was taken into a dark room and permitted to crawl around on the surface of a photographic plate. When the plate was developed, the flashes were found to be sharply defined, thus clearly demonstrating the actinic power possessed by the cold light produced by these tiny creatures.



Photographed "Flashes" of an Ordinary Lightning Bug Appeared in This Manner When the Plate was Developed



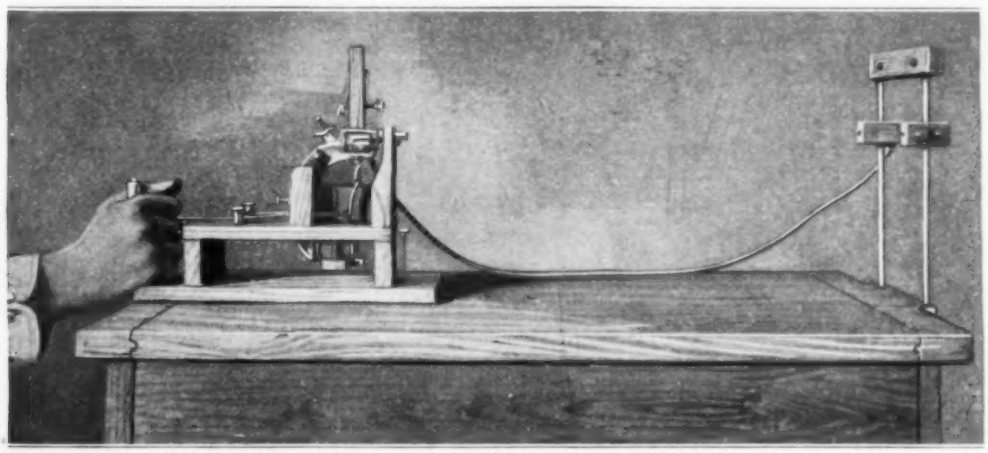
Set-Up of Electrical Apparatus and Camera for Photographing Flight of Bullet from Revolver, at the Rate of 92,000 Pictures per Second: Note Large Lens for Concentrating Light from the Spark on the Object

PICTURES AT THE RATE OF 92,000 PER SECOND

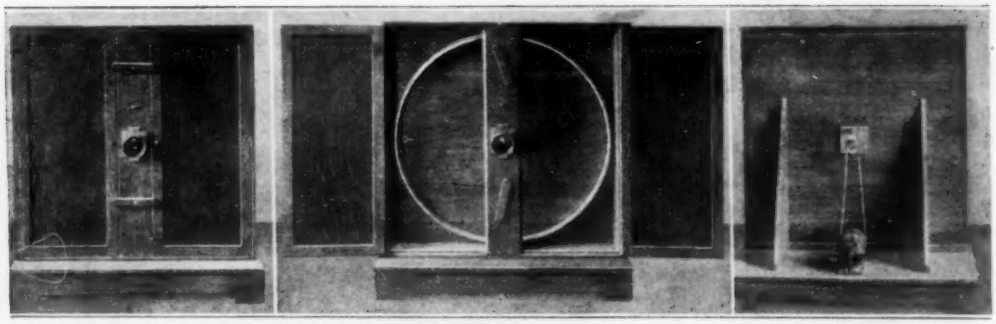
By A. N. MIRZAOFF

FROM an exposure lasting six minutes in the heat of a bright sun to taking pictures at the astonishing rate of 92,000 per second, is the record of 80 years of accomplishment in the science of photography. In considering this, it is interesting to trace some of the steps by which this development has come.

First, there was the clumsy tripod camera with its wet-process plates, simple lens, and crude shutter. Next came the dry plate, and a little later lenses and shutters capable of exposures of .04 second, making snapshots and the hand camera possible. Further improvements in lenses, followed by the introduction of the focal-plane shutter and reflecting type of camera, gave exposures of .002 of a second, and, with some refinement, .001 of a second, of which there is evidence in the pictures, shown in the newspapers and on the screen, of athletes and race horses in action. Still faster speeds dictated the abandonment of the use of sunlight and the mechanical shutter with which it was controlled, and, as in many other instances, recourse was had in electricity. So the next high-



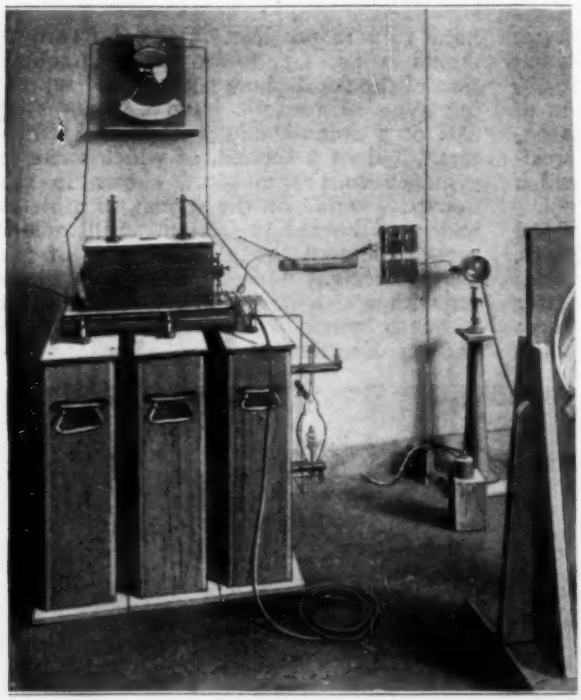
Close-Up of Setting for Filming the Flight of a Revolver Bullet, Showing Extension of the Revolver Hammer Arranged to Close the Electric Circuit That Starts the Camera: The Bullet Breaks a Fine Wire at the Opposite Side of the Table and Stops Camera



Left: Front View of Camera, Closed. Center: Front of Camera, Opened, Showing the Aluminum Ring for Holding the Film, and the Lens in the Center, behind Which Is the Rotative Prism. Right: Rear of Camera, Showing Small Electric Motor Which Drives the Prism

speed camera used a little spark of high actinic value, with a revolving film to produce 5,000 pictures per second. Except that the film is held stationary, this is the basis for the latest development.

The French scientist who has succeeded in making pictures at the rate of 92,000 in a second, secures the strip of film to the inner rim of a drum about 3 feet in diameter, in the center of which is a prism mounted directly behind a high-speed lens. The prism is made to rotate so as to throw a beam of light, coming through the lens, successively on different points of the stationary film. The small motor mounted on the back of the camera, so as to turn the prism at 160 revolutions per second, also runs a commutator device that causes the sparks to be made in step with the turning of the prism. In order to produce sparks of high intensity at regular intervals of short duration, a high-frequency generator with a powerful induction coil and three condensers, is made use of. A large lens is made to focus the object to be photographed upon the lens of the camera, so as to obtain the maximum effect from the light value of the spark. It is arranged so that the action of the object to be photographed will control the starting and stopping of the camera, because the time required for the complete film of pictures is so small, when compared with the utmost rapidity of any human agency.



Electrical Equipment Used in Connection with the High-Speed Camera: The Induction Coil Which Raises the Voltage from 10 to 12,000 Volts Appears above the Three Condensers

Photographing the flight of a bullet, and the wing motions of birds and flies, as well as other rapidly moving objects, and afterward studying these actions by slow-motion apparatus, is the interesting possibility this new camera suggests.

¶An enterprising manufacturer has developed a lead-welding outfit, similar to the apparatus used by lead burners, that is particularly adapted to the needs of storage-battery repairmen. It is supplied for use with oxygen in connection with hydrogen, acetylene, city or natural gas, whichever is most conveniently available, and is complete in all details, including an assortment of burner tips, hose, regulators, gauges, burner, and tank connectors.

OUTPUT OF POWER STATIONS POOLED IN ENGLAND

Intended to bring about cheaper power for industrial and domestic uses, and to remedy certain absurd conditions now existing around London, the reorganization of the entire electrical distribution system is planned in England, by a parliamentary act. It is believed that an enormous expansion in the use of electric current will follow the adoption of the reorganization plan, and that if power stations are centralized and their outputs pooled, there will be a great saving in capital expenditure as well as in cost of production.

WINDOW KEPT FROM RATTLING BY INEXPENSIVE WEDGES

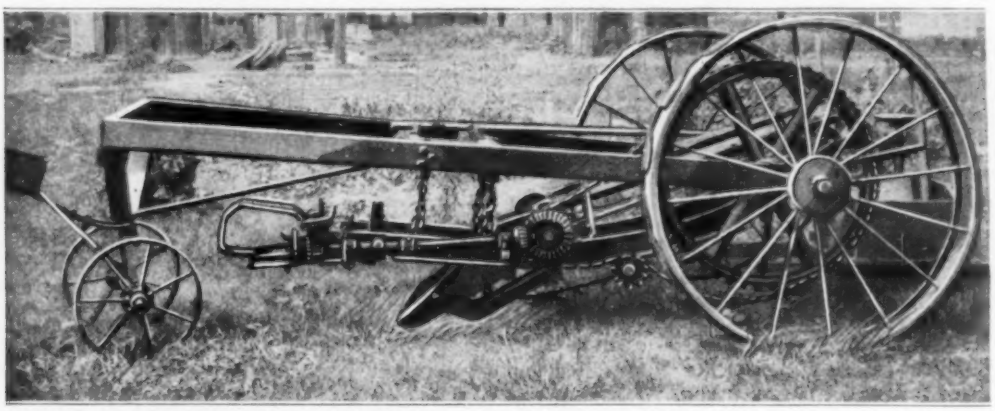
Rattling of windows—an annoyance so commonly experienced—can be averted by the use of small and inexpensive wedges introduced recently by a Canadian inventor. The contrivance consists of two pieces of nickel-plated brass, or steel, that are quickly and easily attached to the sash by a half-inch screw. In addition to eliminating the irritating noise caused by a loose window, the wedges conserve warmth and thereby save fuel by shutting out drafts from around the sash. They do not mar the woodwork, and are of such size as to be practically unnoticeable.

BENT-WOOD FOLDING CHAIRS OF EXTREME COMPACTNESS

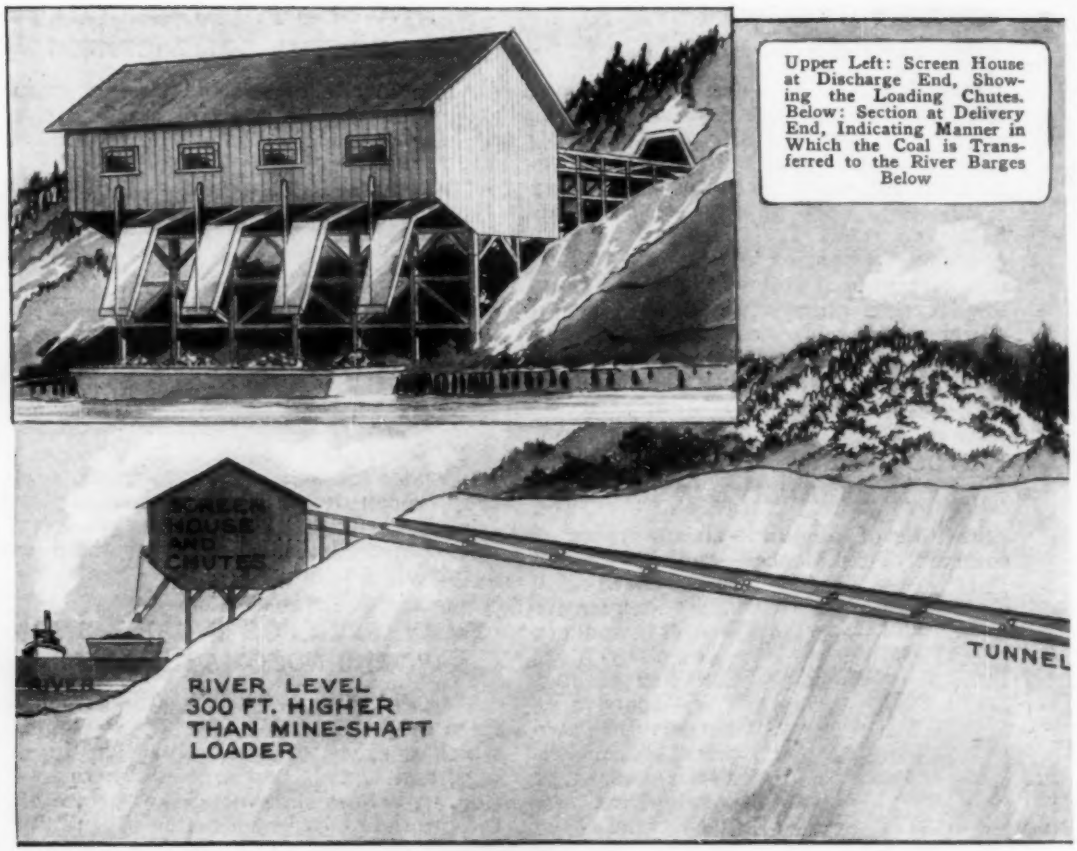
Chairs made of selected straight-grain oak, or ash, with metal back supports, can be folded so compactly that six of them will occupy a space of only 7½ inches. Pivoted in the bent-wood frame is an oval seat of black imitation leather. The metal parts are enameled and rustproof, and the wooden frame has a fumed-oak or bog-green finish. The chairs are very light, but are built strongly enough to be durable.

HARVESTER FOR SUGAR BEETS WORKS AUTOMATICALLY

Harvesting sugar beets has been facilitated by the invention of an Illinois man, which consists of a machine that tops, digs, and boxes the product. In operation, two shoes slide along the surface of the ground and carry a cutter which cuts off the beet top at the required height, throwing the severed portion to one side. Following the topper, comes a digger, or uprooter, which removes the beet from the ground and carries it to the rear, where it is deposited in a box or basket. The outfit is easily drawn by a team of horses and, due to its few working parts, should prove a popular implement.



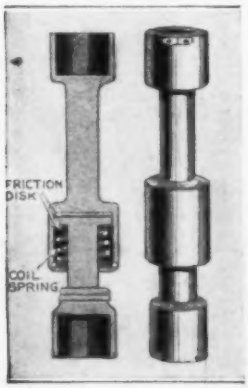
This Machine, Weighing Less than 500 Pounds, is Pulled over the Ground by Two Horses and Automatically Cuts Off the Tops of Sugar Beets, Digs the Beets, and Deposits Them in a Box at the Rear



Upper Left: Screen House at Discharge End, Showing the Loading Chutes. Below: Section at Delivery End, Indicating Manner in Which the Coal is Transferred to the River Barges Below

SELF-THAWING OIL-PUMP DRIVE FOR OLD-MODEL AUTOS

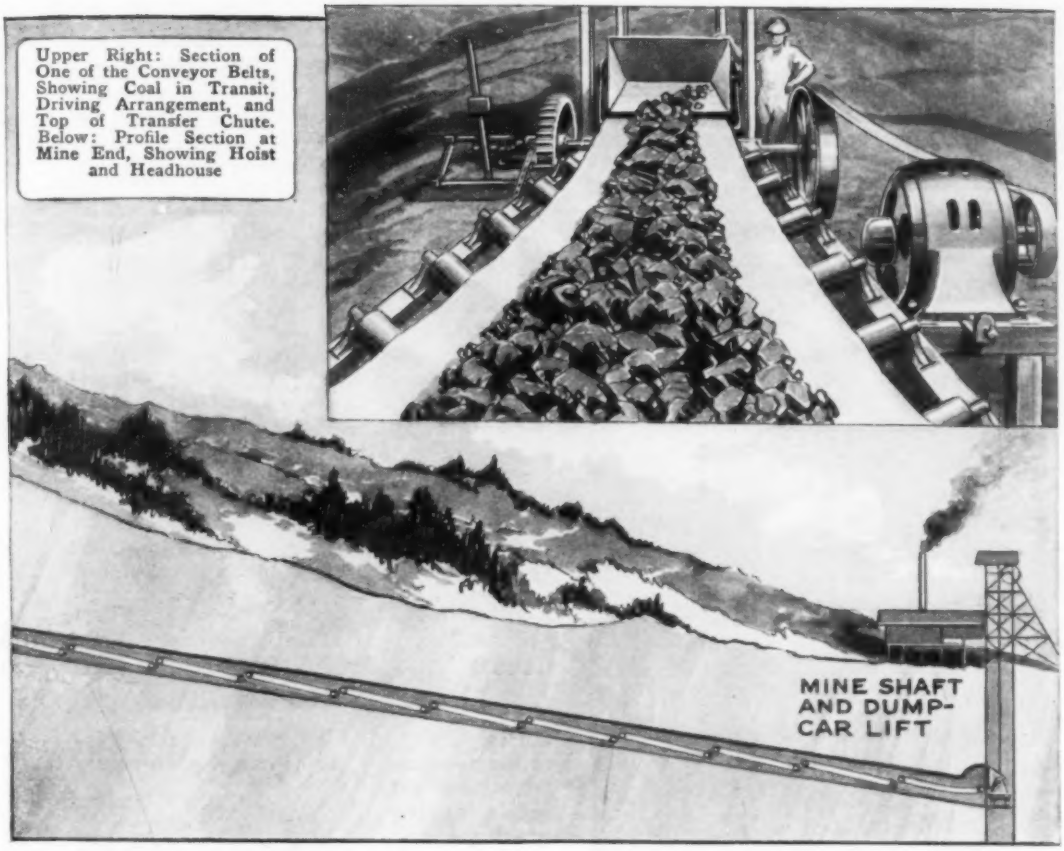
An oil-pump drive, designed to replace the conventional oil-pump spring used in some automobile motors, of models earlier than 1920, will automatically thaw out a frozen oil pump. The device is simply a friction clutch with a spring pressure on a fiber friction disk of special material, which is practically waterproof and a good conductor of heat. The pressure is sufficient to drive the pump under normal conditions. When the pump is frozen the disk slips, creating enough heat by friction to thaw out the pump, after which the normal drive is resumed.



BELT TO CARRY MINE'S OUTPUT THROUGH LONG TUNNEL

An eastern coal company, in opening up three new mines situated close together, was confronted with the problem of transporting the output to a river 4¼ miles away, with steep and rugged hills intervening. A railroad around the hills or one through them appeared to be too expensive in first cost and in operation, so it was decided to bore a small tunnel through the hills and convey the coal on a series of belts.

The distance of 4¼ miles, in which there is a rise of 300 feet, will be made with 20 conveyors in series, each delivering the coal to the one ahead. At the loading end, the belt will be 5 feet wide for receiving the coal direct from the mine cars as they are hoisted up the shaft, and will carry the coal 1,500 feet to the next conveyor, which will be 4 feet wide. The unloading belt at the river will be 4 feet wide, and will deliver to four or six other belts, which discharge the coal through chutes into barges. The belt,



Upper Right: Section of One of the Conveyor Belts, Showing Coal in Transit, Driving Arrangement, and Top of Transfer Chute. Below: Profile Section at Mine End, Showing Hoist and Headhouse

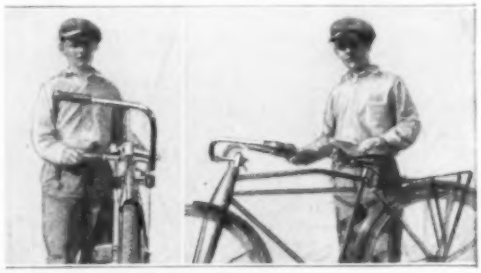
which will be made of a rubberized fabric, similar to automobile tires, nearly 1 inch thick, is estimated to have a capacity of 1,200 tons of coal per hour. It will run on low-friction troughing idlers.

GOLF CHART IS PRIMER FOR BEGINNERS

A firm has put a new invention upon the market, which is a sort of primer for all golfers. By graphic, line-drawn pen-and-ink sketches all positions of hands and sticks are shown on a large folder. Every picture is numbered, there being 72 in all. The first one shows the position of the player's hands as it should be. Others show how to stand when putting, driving, or making other plays.

NEW ADJUSTABLE HANDLEBAR CONVENIENT TO CYCLISTS

A patent has been allowed on a new handlebar for bicycles, that permits horizontal rotary adjustment, making it possible to swing the bar readily from its normal position to one at right angles to the frame, so that it can be used to support the bicycle against a building. There is an expanding handlebar stem surrounded by a collar with notches that engage a dog. The collar carries the handlebar extension which is adjusted and held to the handlebar proper by a spring-actuated lock. No wrench is needed, as the dog can be operated and the sleeve adjusted with the thumb and forefinger.



A New Adjustable Handlebar for Bicycles, Which can be Turned, as Shown at the Left, So That the Cycle can be Rested Safely against a Wall

STRETCHING OF STEEL CHAIN MAKES IT RIGID AS BAR

Steel chains are usually thought of as being flexible—just the reverse of a bar—but one of these belonging to a large railroad, recently underwent a curious transformation. The chain, which was 25 feet in length with ⅞-inch links, was used to pull a derailed car back on the tracks. The strain was so great that when the task was completed the links were found to have straightened out enough to lock them together, and the whole chain was as rigid as a solid bar of steel.

These Railroad Men are Holding a Steel Chain Which, after Using, was Found to Be Perfectly Rigid

ELECTRIC-DRIVE FERRYBOATS COMING TO THE FORE

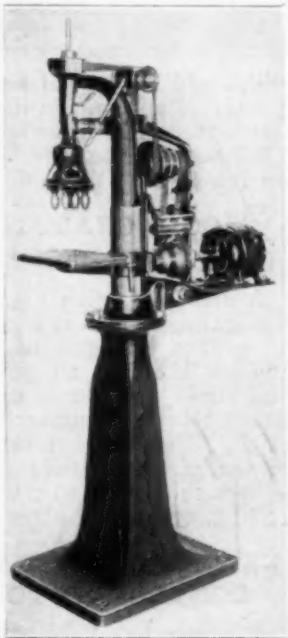
First tried on warships, the so-called electric drive later was tried on some merchant vessels and has lately been applied to ferryboats. Such boats are now in operation in the East and on the Pacific coast, and two new boats of this type are to be used by the Staten Island ferry service at New York City. They will cost about $1,000,000 each, and will be 218 feet long, with four driveways for autos and horse-drawn trucks on the lower deck, which will be open from the end to the side of the boat. A steel and concrete stairway at each side of either end of the boat will lead to the passenger deck.

The usual cabin seats will be installed on all sides of the boat, and to the rear a special line of seats for passengers who desire to smoke and at the same time be shielded from the wind. To a great extent the boat will be constructed of steel, with the four driveways entirely fireproof. The four driveways themselves constitute a distinctly new feature.

Twin, independent screw propellers at each end of the boat, driven by electric motors with alternating current of 2,300 volts, and generated by a high-speed steam turbine, will be the power of propulsion.

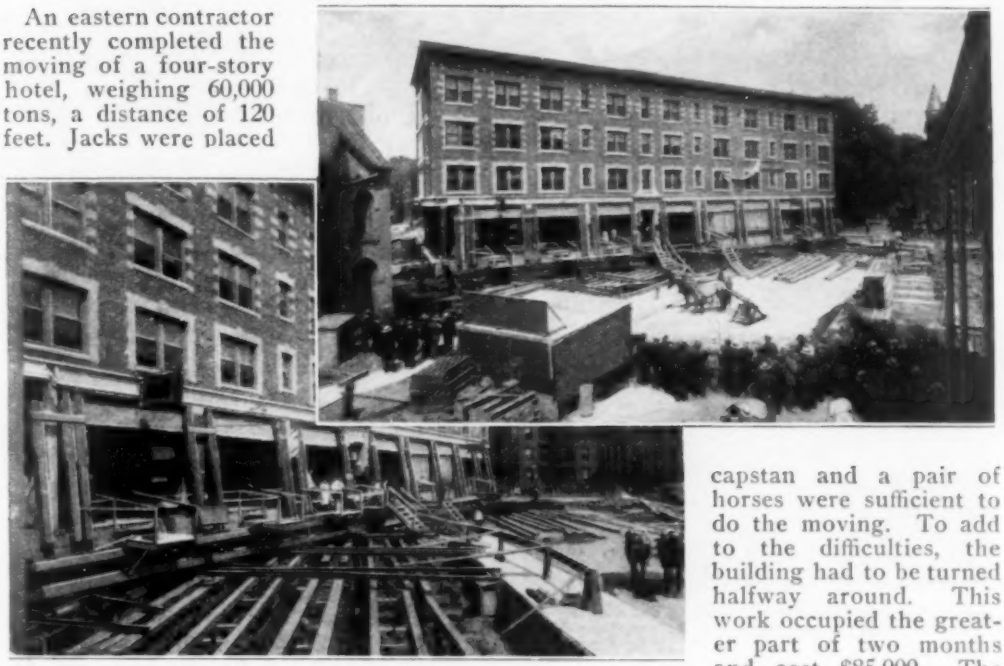
COMBINED MULTIPLE-DRILLING AND TAPPING MACHINE

Designed for small work, a multiple-drilling machine that can be instantly converted into a tapping machine has five adjustable spindles that may be used singly or collectively. Each spindle has a chuck for holding either a drill or a tap. The machine is driven by a ½-horsepower motor, and by means of cone pulleys with a special adjustment for taking up the slack of the belts, speed changes of a wide range are made quickly and easily. The spindles can be adjusted from a minimum center distance of ⅞ inch to a maximum of 4½ inches.

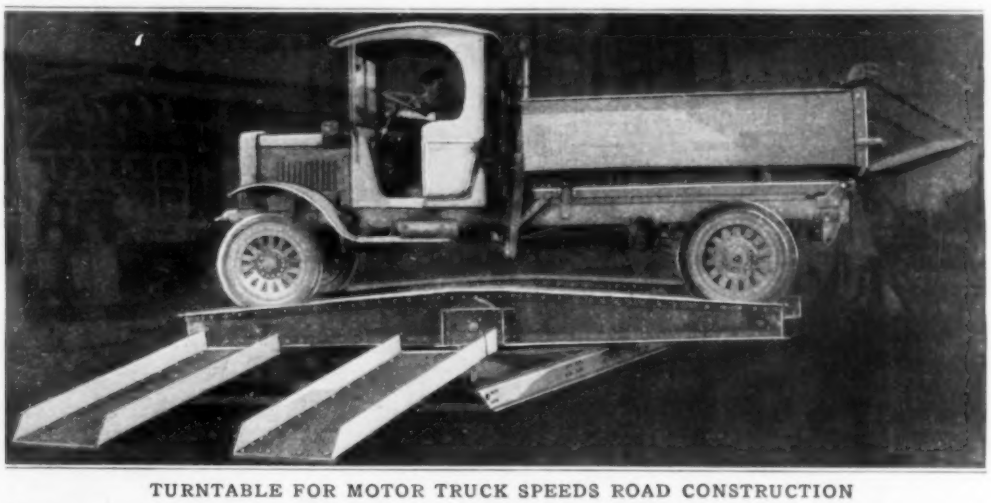


HOTEL MOVED TO NEW SITE, 120 FEET DISTANT

An eastern contractor recently completed the moving of a four-story hotel, weighing 60,000 tons, a distance of 120 feet. Jacks were placed every 4 feet under the building, and it was kept so level and the work was otherwise so well arranged, that a capstan and a pair of horses were sufficient to do the moving. To add to the difficulties, the building had to be turned halfway around. This work occupied the greater part of two months and cost $85,000. The outcome of this undertaking has been watched with interest by construction men throughout the country, because of the size of the building and the distance moved.



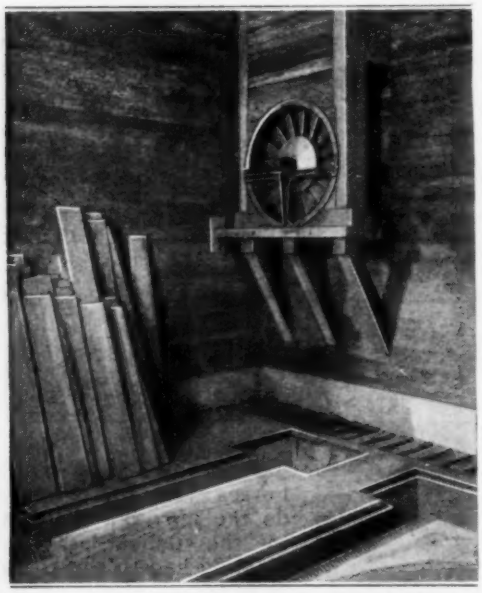
Upper Right: General View of Hotel Building in the Process of being Moved through City Street. Lower Left: Close-Up, Which Shows Timbering Necessary to Support Upper Floors While Moving. Also Timbers and Rails along Which the Building was Pulled



TURNTABLE FOR MOTOR TRUCK SPEEDS ROAD CONSTRUCTION

THIS turntable has been designed for use in road-construction work and is expected by the producers to be a great saver of time, labor, and money. Where highways are being built, it is usually a difficult task to turn the large machines which haul the stone, sand, or other materials, and this necessitates considerable backing of the trucks to reach the desired points. With the use of the newly introduced turntable, any kind of motor-driven car can be turned by power derived from its own rear wheels, these running on a treadmill arrangement that revolves the table.

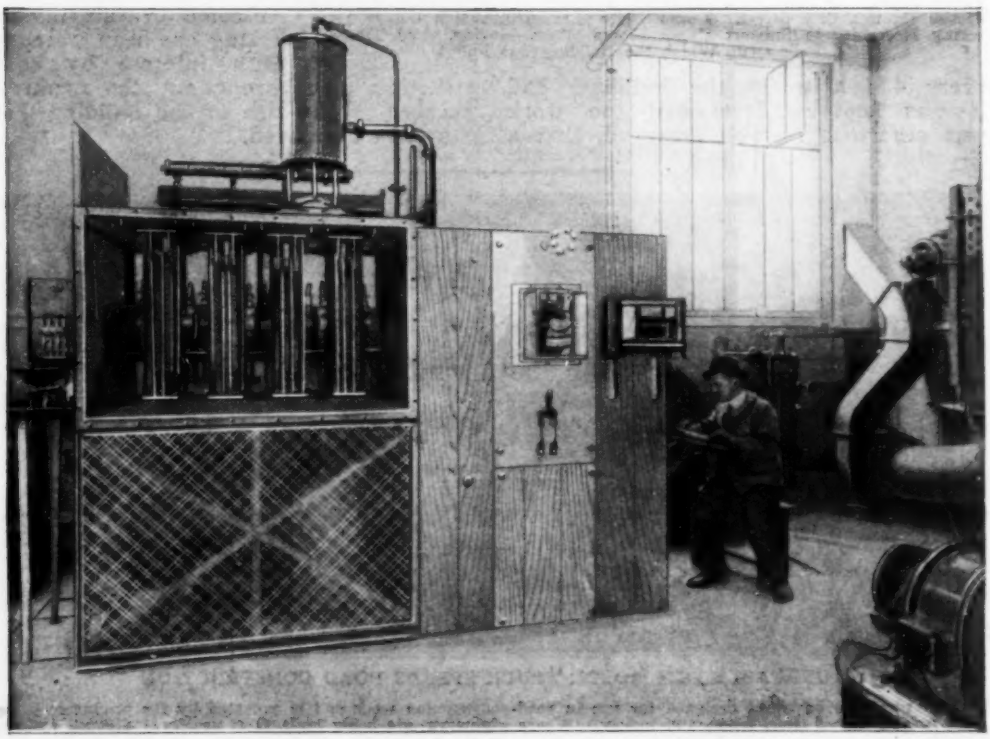
SPEED KILN-DRYING PROCESS AND IMPROVE LUMBER



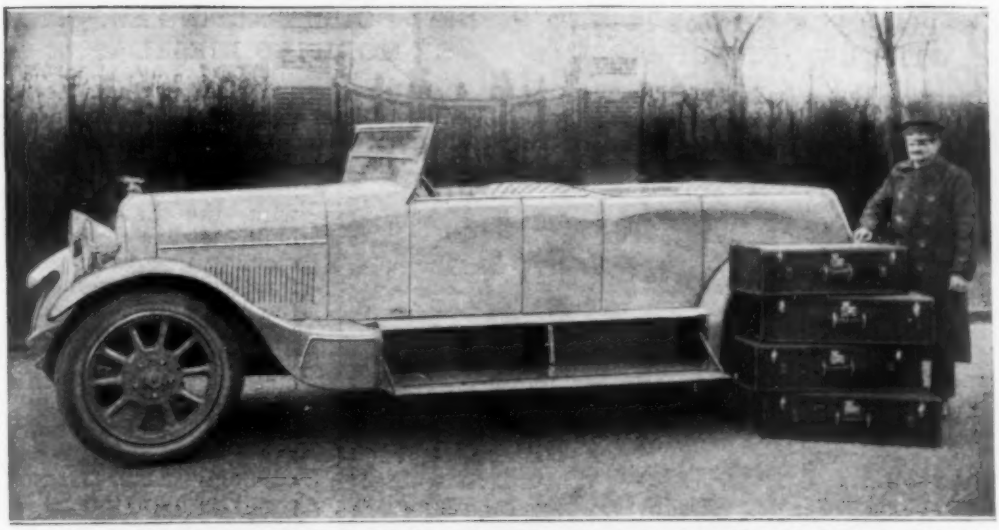
One of the Lumber-Drying Rooms: The Heated Air Comes Upward from Radiators below the Floor, and the Fan at the Right Keeps It in Circulation

In France, because of the need of speedy construction in the devastated regions, the older method of drying and seasoning lumber in the air has been found too slow for requirements. Now, however, a new process has been devised that makes it possible to kiln-dry lumber, ready for building construction, in a period of two days. The lumber is piled in a series of small buildings and heated air containing an excess of oxygen, or ozone, is circulated through them. This method not only speeds the drying process, but is very effective in killing the germs that infect the green lumber and are not always exterminated by ordinary kiln drying. As a result of this treatment, the building lumber is stronger and of better grade than that dried by the older and slower method.

¶Scientists who have been conducting experiments in sterilizing milk, are of the opinion that they have discovered a method of destroying typhoid and tuberculosis germs. Fourteen thousand quarts of milk have been used in their work.



The Battery Room at the French Lumber-Drying Plant: The Apparatus Shown Is for Producing the Highly Oxygenized Air, or Ozone, Which is Later Heated. At the Right, above the Man's Head, Are Recording Instruments That Measure the Flow of Air on Its Passage to the Drying Rooms



The Four Good-Sized Traveling Cases, Standing on the Ground at the Rear End of the Automobile, Fit Snugly into the Compartments Built under the Running Boards, There Being Duplicate Spaces on the Other Side of the Car

SPACE UNDER RUNNING BOARD USED FOR LUGGAGE

For the convenience of the motorist who uses his car to go on week-end jaunts or short trips, a body has been designed with luggage space under the running boards. There are two compartments on each side of the car, and neat cases fit snugly in these spaces. The construction of the running boards is such that the cases are protected from rain or mud. These running boards do not detract from the appearance of the car.

CONCRETE BRIDGE ARCHES BUILT BY NEW METHOD

In order to prevent the deflection of steel ribs when used in the construction of reinforced-concrete bridge arches, a method of bracing them with cables has been employed in Europe. Self-supporting arch ribs of standard steel shapes are set up and are kept rigid by ties connected to them from below and suspension cables from above. This allows them to be used for the support of the forms, without the necessity for any centering, and without deflection while the concrete is being poured. On account of their rigidity, the setting of the concrete is not interfered with by movements of the ribs. When the concrete has set, the ties and cables are removed.

DRIVER HAS NARROW ESCAPE WHEN TREE KILLS HORSE

In a storm that swept Manila not long ago, the wind reached a velocity of 90 miles an hour, and numerous vessels were wrecked, buildings were demolished, and practically every tree in the city was laid low. A curious incident of the storm was the almost miraculous escape from death of a native cab driver. Hurrying along a country road seeking shelter, his cab was hit by a falling tree and smashed. The horse was instantly killed, but the driver escaped without a scratch.

Although His Horse was Instantly Killed, the Driver of This Cab Escaped without a Scratch in a Recent Great Storm in Manila When the Large Tree Fell across His Vehicle as Seen Here

UPPER DECK OF BUS FITTED WITH UNIQUE TOP PIECE

Improved tops built over the seats of the upper deck are being adopted by a Detroit bus line. A light wooden frame supports the roofing. There is no covering for the aisle nor is the air shut off by bulky window cases. In disagreeable weather, the sides are inclosed by strips similar to auto curtains.

The Top Built over the Seats of the Upper Deck on the Bus Is an Innovation in Motor-Bus Equipment. There Is No Covering over the Aisle; Strips Similar to Auto Curtains Inclose the Sides in Rough Weather

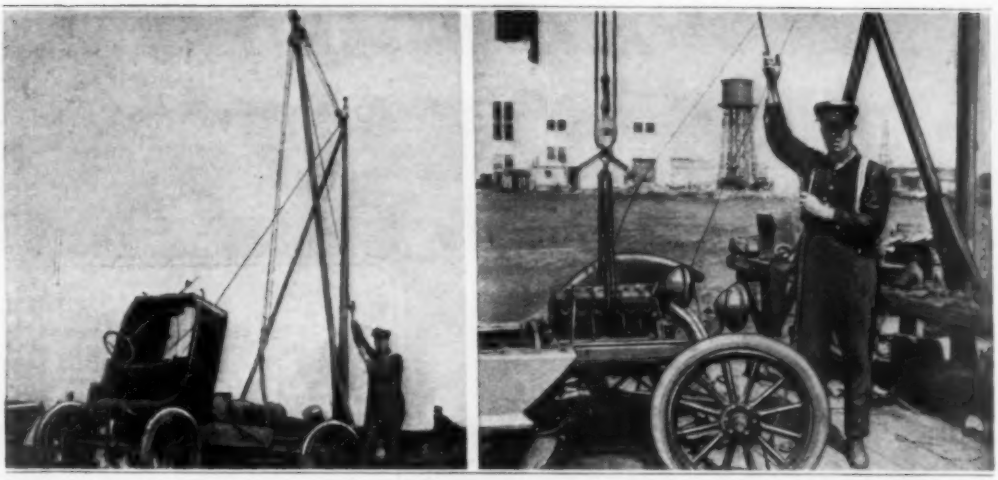
NEW DOUBLE-ACTING ENGINES OF MODIFIED DIESEL TYPE

Double-acting marine engines of a modified Diesel type are being developed with great success in England. After a series of experimental investigations completed with the first models built, it has been decided to construct a three-cylinder engine of the same type, designed to develop 2,000 brake horsepower. At 100 revolutions per minute, this will be done with cylinders of 24½-inch bore, and 44-inch stroke — exceedingly small as compared with anything like the same power in single-acting cylinders. It will be a remarkable achievement in other ways, for the largest power that hitherto has been developed in commercial marine Diesel engines is about 650 brake horsepower per cylinder, so that the double-acting type even at this early stage of development represents an advance on existing practice. Its weight will be only about one-half that of a corresponding single-acting motor.

CRUISE OF THE GREAT LAKES IN OPEN ROWBOAT

In a 16-foot combined motor and rowboat two young adventurers from Detroit have recently started on a 4,000-mile cruise around the Great Lakes. Their destination is Duluth, via the American shore of Lake Huron, St. Mary's River to Lake Superior, and thence along the shores of Michigan and Wisconsin. They will return to Detroit the same way. The boat is fitted with a 2½-horsepower marine engine, which in ordinary weather and smooth water propels the boat at a speed of between 7 and 8 miles an hour. Oars are provided to help handle the boat in bad weather. Navigation papers were taken out at Detroit, and the boat is outfitted to comply with the navigation laws.

Two Youthful Adventurers of Detroit About to Start on a 4,000-Mile Cruise of the Great Lakes in a 16-Foot Combined Motor and Rowboat. Its Motor Is 2½ Horsepower



Left: Rigging Removed from a Yacht and Set Up Ashore, being Used for Hoisting the Engine from an Automobile and Moving It to a Workbench. Right: Mast and Boom from the Yacht Shown Set Up beside the Owner's Workbench Ashore, with an Automobile Engine Suspended from Its Tackle

YACHT'S RIGGING UTILIZED IN AUTOMOBILE WORK

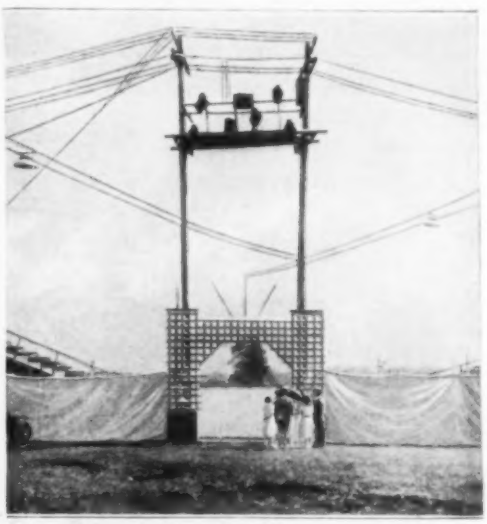
A resident of California, who is both a yachtsman and an automobile dealer, has taken advantage of this combination of occupations by using the mast of his yacht, with its boom and tackle, to help him dismantle his motor cars. He removes this rigging from his yacht, and sets it up near a workbench on shore. The boom is 35 feet long, and can be swung in any direction so that the tackle, dangling from the end of it, will reach an automobile from which the engine or other part has to be removed, and placed upon the workbench for repairs. The guys that brace the mast are detachable, and can be moved as needed to make way for the boom.

HISTORIC DELAWARE CROSSING TO BE MEMORIALIZED

It is planned to have a national park at the site where Washington made his strategic crossing of the Delaware, with highways marking the routes of the colonial forces, a memorial bridge having a section devoted to each of the 13 original colonies, and a monument of Washington actually crossing the river, erected in midstream, as the main features. Monuments to patriotic and illustrious Americans, as well as historic memorials by the various states and organizations, are a part of the plan to make the proposed park a great center of patriotic devotion. The park will be on both sides of the river.

AMPHITHEATER ILLUMINATED BY EXTERIOR LIGHTS

Illuminating an open-air amphitheater by means of exterior lights, thus eliminating any objectionable and sight-obstructing posts, or towers, was the plan followed by the Masonic lodges of Detroit, Mich., recently, when these bodies staged a pageant entitled "The Awakening." Seven high platforms, each supporting a battery of five searchlights, were erected around the outside of the large arena, which covered approximately 15 acres and had a seating capacity of 15,000 spectators.



One of Seven Towers, Each Supporting a Battery of Five Searchlights, That were Erected around a Large Detroit Amphitheater for Illuminating It

CAMELS AND OTHER CONVEYANCES USED IN

Long File of Camels, Shown across the Tops of Both Pages, Carrying Provisions into What is Known as the "Back Country" in Central Australia: The Arid Nature of the Country Makes Camels Indispensable as Beasts of Burden

Immediately below the File of Camels Is a Picture of a Long Mixed Freight and Passenger Train on Its Way to Oodnadatta, in the Northern Part of South Australia

Next Below is Shown a Camel Bridled and Saddled, upon Which is Mounted a Lady Rider. Necessarily She Rides Astride, for a Sidesaddle on a Camel would Be Quite Impossible. She Is the Wife of the Missionary Shown Elsewhere

The Baby Camel Strapped to Its Mother's Back, Shown at the Bottom, is Amply Provided with Comfortable Trappings. The Driver of This Camel Is an Afghan Who, on Account of Conscientious Objections in That Connection, had to be Photographed Warily

THE ARID REGIONS OF CENTRAL AUSTRALIA

The Upper Right Picture Shows a Central Australian Team of Eight Goats Hitched to a Cart-load of Firewood, Which must be Brought from Afar in This Barren Country. The Animals are Harnessed and Driven in the Same Manner as Dogs in the Frozen North

The Next Picture Below Shows How the Reverend J. Armour, an Australian Missionary, Travels around His Parish. The Fact That This Parish Is 300 by 500 Miles in Size Accounts for the Large Amount of Baggage He has to Carry

In the Lowest of the Three Pictures to the Right the Same Missionary That is Driving the Buggy in the Picture Above, is Shown with a Motor Car on His Way across the Bed of a Dried-Up Lake

The Missionary Buggy is Shown Below with a Team of Camels Hitched to It with the Same Harness and Collars as Used on the Horses, Which Explains Its "Poor Fit." The Bridles, of Course, have to Be Different

DIVERS WORK IN CAVITIES OF BIG CONCRETE PILES

Most people nowadays know what a concrete pile is, but several hundred concrete piles extraordinary are being used in the construction of a new government pier at Vancouver, B. C. They are 7 feet in diameter, and because each pile is being driven right down through the mud to bedrock, any one of them may be well over 100 feet in length before it is completed.

For convenience of construction, these mammoth piles are made in sections, about 10 feet in length, and are hollow, the inner space being about 5 feet in diameter. This space is filled up with concrete as soon as the shell is down to the rock bottom. The hollow space makes it possible for divers to inspect the bottom, inside the shell, during the driving, and also makes it easy to dispose of the large amount of earth which is necessarily displaced when so large a cylinder is forced into the harbor bottom. This material—mostly mud and sand—is lifted out by an orange-peel bucket, which removes from a quarter to a half cubic yard at each lift.

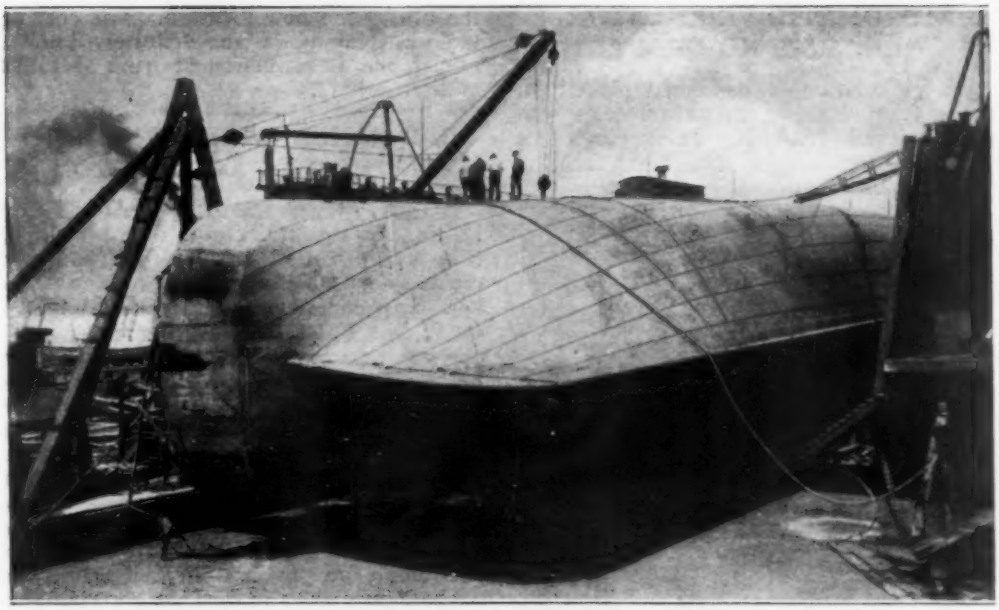
Diver Returning from Inspection Trip to Bottom of Huge Concrete Pile, Nearly 100 Feet below Surface of Harbor: The Water Pouring Out of the Holes in the Heavy Cast-Iron Rings, Comes from Hydraulic Jets Employed to Aid in Sinking the Pile

As the material is taken out of the center in this manner, the great pile sinks by its own weight, aided by enormously heavy cast-iron rings, which are laid on top of all as additional ballast. But sometimes even this is not enough, and recourse is had to powerful jets of water, directed against the sand or gravel around the bottom edge of the pile. This operation was in progress when the accompanying photograph was taken, and it shows that the water inside the cylinder has risen to about 15 feet above the level of the water in the harbor, owing to the volume discharged by the powerful pumps used for the "jetting" operation.

In this particular instance, a peculiar accident had occurred just before the picture was taken, and the diver shown sitting in a sling just above the central opening had just returned from a trip to the bottom to investigate the occurrence. Everything had been taking its normal course, and jetting was in progress, when a column of water suddenly shot up to a very considerable height from the surface of the harbor a few feet from the pile. It was thought at first that the lower edge of the big cylinder had broken through a submerged water main, of which there are several in the vicinity. This was found not to be the case, and the only explanation forthcoming was that the water from the jet had found its way through a fissure of some kind, and thus had broken through the harbor bottom and caused the alarming, fountainlike occurrence.

LOCATING UNCHARTED LAKES BY AIRPLANE

One of the latest uses of the airplane is locating and photographing many Alaskan lakes that heretofore have not appeared on any map. Recognizing that many of these "lost lakes" may be sources of valuable water power, the Forest Service, Department of Agriculture, with the approval of the Federal Power Commission, has laid plans to map this no man's land by means of aerial photographs.

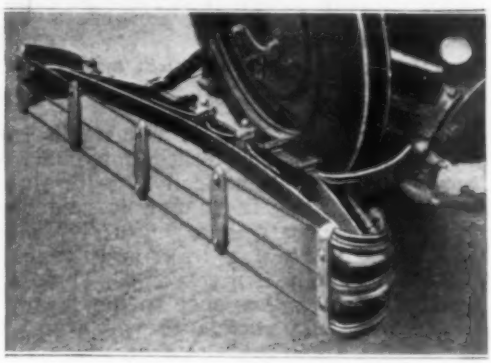


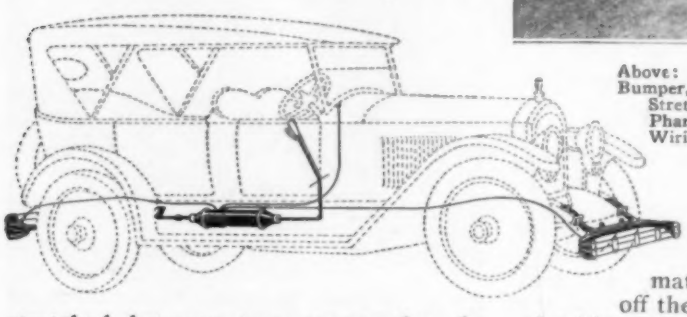
SALVAGING A WRECKED OIL TANKER BY DOCKING IT SIDEWAYS

VERY unusual conditions accompanied the salvaging of the oil tanker "Chagres," which sank off a marine repair plant's wharf at New Orleans. By the use of compressed air, which was pumped into the hull to make it partly buoyant, it was raised with derricks and cables, but as soon as it reached the surface, it turned over on its side, and began to sink again. Tugs made a dash for it, and before the hull had time to sink, they got about two-thirds of it into a floating dock, which was then raised and repair was started.

AUTOMOBILE SAFETY BUMPERS STOP CAR AUTOMATICALLY

With an external mechanism that replaces the ordinary bumpers of a motor car or truck, an automatic brake and ignition control that stops the car quickly in case of collision has been designed, primarily to prevent accidents at slow speeds and in heavy traffic. The substitute for the bumpers, at each end of the car, consists of three small cables,



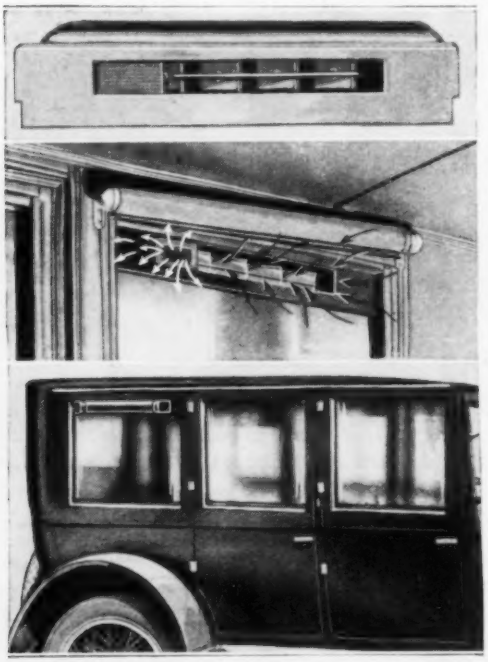


Above: Car Equipped with the Safety Bumper, Showing the Contact Cables Stretched between Goosenecks. Left: Phantom View of Automobile, Showing Wiring for Contact Bars, and the Brake and Ignition Control

stretched between two goosenecks, the full width of the car like other bumpers. Any pressure on the cables that is sufficient to force them back ¾ inch makes an electric contact that causes current to flow to a brass case on the brake rod, which contains devices that automatically set the brakes, cut off the ignition to the engine, and also blow the horn. By this means, it is said, a car can be stopped in one-third of the time and one-half the distance that would be possible with hand or foot brakes.

AUTOMATIC VENTILATOR CREATES NO DRAFT

A new ventilator has been placed on the market for use in automobiles and other closed vehicles. It employs the



Top and Center Show Ventilator as It Appears from Inside of Car. Below, Ventilator is Seen on Outside of Car

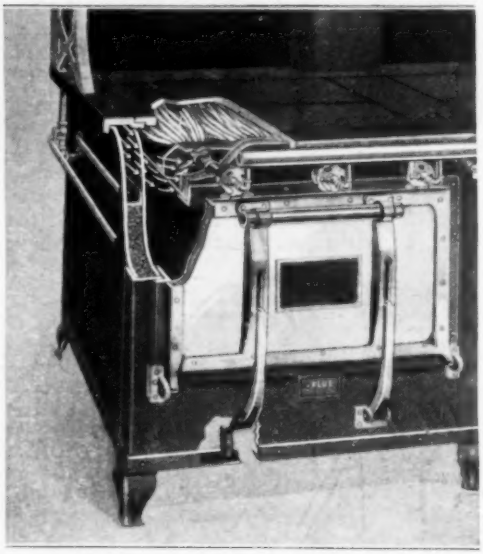
vacuum principle, and is adjustable to any desired degree of ventilation, where it will operate automatically. With this arrangement, the air change is said to take place so gently and uniformly that the dangers of chilling drafts and sudden temperature changes are avoided. It does not add any inconvenience to the use or operation of the vehicle to which it is fitted, nor does it spoil its appearance.

CITY SITE AND BUILDINGS MOVED TWO MILES

The moving of Hibbing, Minn., for a distance of two miles, begun by a northern mining company some two years ago, has recently been completed. The town was founded and rapidly grew over a large and rich deposit of iron ore, and it was for the purpose of mining this ore that the moving scheme was conceived, as mentioned in the April, 1920, issue of this magazine. The numerous buildings, of all types of construction, were virtually transplanted in their entirety from the old to the new location. The cost of the undertaking is not definitely known as yet, but is estimated at from 15 to 18 million dollars.

GAS RANGE WITH EFFICIENT METHOD OF COMBUSTION

A gas range, specially designed for hotels, restaurants, clubs, and hospitals, that is said to cost less for fuel than any ordinary coal range, is now on the market. In general appearance the range is much like other gas-burning ranges, excepting that its burners are completely inclosed, being covered on top with unobstructed plates which can be made uniformly red-hot from end to end in 15 minutes. This is done by means of a new type of siphon burners which are mounted the full length of the range in front, throwing a fan-shaped flame from front to back. The radiation of this flame encircles the oven, eliminating oven burners, and then passes out through the flue. A steam pipe in rear of the range extends through the flame passage and injects superheated steam into the oven, making it possible to obtain such high temperatures that roasting is done very rapidly and effectively. There is no cold-air intake, the air, before it reaches the combustion point, being heated by pass-



View of Gas Range, Showing by Arrows How Heated Air Mixes with the Flames in the Combustion Zone

ing up a hot duct and around the flues. The entire body of the range is well insulated, preventing excessive heat radiation.

Soundproof "Crying Room" for Babies Which was Built in a Large Motion-Picture Theater: Mothers can Take Their Restless Children Out of the Audience and Watch the Picture through the Glass Wall of the Room

"CRYING ROOM" FOR BABIES BUILT IN THEATER

Babies can cry to their hearts' content without disturbing anyone in a theater in Los Angeles, Calif., where a special room has been constructed for this purpose. A soundproof inclosure has been built at the rear of the first balcony and is provided with a wall of glass at the front, so that mothers can watch the picture while endeavoring to comfort their restless infants.

YOUNG CATTLE EASILY WEANED BY AUTOMATIC DEVICE

BY COURTESY OF LA NATURE

A Frenchman has invented a halterlike arrangement which he puts on the head of young cattle, so that they may be weaned without having to separate them from the rest of the herd, and with little trouble to the farmer. A bit in the mouth allows them to eat and drink while it prevents them from sucking, thus forcing them to feed themselves.

HUMAN THROAT INSPIRATION OF TALKING MACHINE

Claiming the human throat as the inspiration of his invention, a Colorado man has introduced a new type of talking machine.

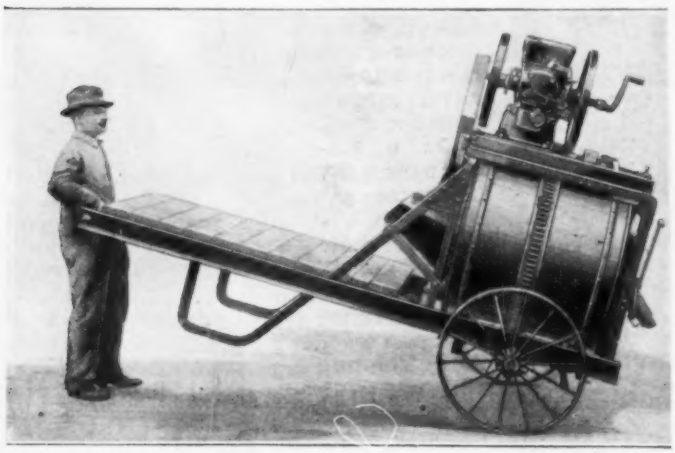
The exterior of the machine appears similar to others of the cabinet form, but the interior contains numerous departures from the usual make of instruments. The essential part of the innovation is a metal appliance fashioned after the throat and inclosed in the apex of a wooden horn of heavy construction. The tone is also increased by means of various other sound-absorbing and magnifying arrangements, the chief one of these being in the shape of a kettle-drum and suspended from the lower part of the wooden horn, or tone chamber, of this strange phonograph.

SMALL LAMP FOR DRIVEWAYS SHIELDS AGAINST GLARE

A shield eliminating the usual glare of the road light is the feature of a new miniature lamp which seems to have a high degree of practicability. The lamp is 2½ feet high, of cast iron, and sheds light over a radius of 15 feet. It is designed for use on private driveways, at country homes, or entrances, and other places of vehicle travel.

TWO-WHEEL CONCRETE MIXER OF EXTREME PORTABILITY

A concrete mixer, of exceptional portability, is built in connection with a two-wheeled truck in such a manner that, when one end of the truck platform is raised to a height of 3 feet, the whole machine is in perfect balance on the wheels. This is accomplished by placing the mixer, with the engine directly above it, between the two wheels. The platform is used for charging the mixer from a wheelbarrow by dumping the material directly into the hopper of the mixer without any shoveling whatever.



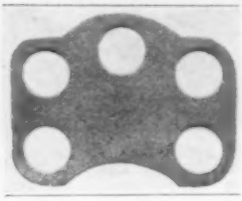
Concrete Mixer So Constructed That, When the Platform is Raised, as Shown, the Whole Machine Is in Perfect Balance over the Axle of the Two Wheels, and Therefore Easily Portable

GIANT AIRPLANES TO CARRY 100 PEOPLE 500 MILES

An Italian designer has undertaken to build a machine capable of carrying 100 passengers for a 500-mile flight without stopping. It will have 16 engines of 300 horsepower each, a width of nearly 180 feet, and a carrying surface of 10,500 square feet. Another Italian firm is building a hydroplane to travel about 1,800 miles without stopping, for the Portuguese airmen who will attempt to repeat their transatlantic flight.

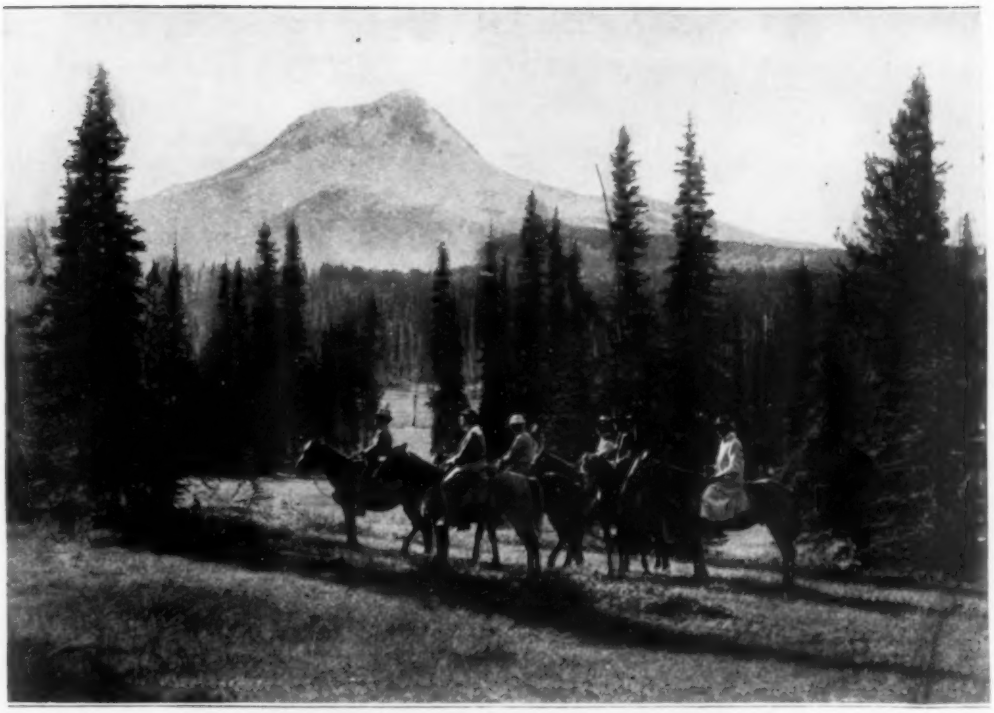
ICE-CREAM CONE HOLDER MADE OF PASTEBOARD

A handy pasteboard holder for ice-cream cones is now available for picnics, beach parties, and other places where the ice-cream cone reigns as a favorite. The pasteboard is 8 by 5 inches in size, and has circular holes for five cones. One of the sides is shaped so that it forms an easy handhold. The practical little device has found much favor among consumers.



CLAIM FIRE EXTINGUISHERS MAKE DEADLY GASES

A recent subway accident in New York, where many persons were overcome by deadly gases, raises the question as to whether, under certain conditions, hand fire extinguishers may be the source of considerable danger to human lives. When the accident occurred, fire started from a short circuit on the switchboard panel of one of the cars. Because of the place where the arc formed, it could not be stopped by shutting off the power. When the contents of hand fire extinguishers were played upon this electric arc, gases were generated that overcame some passengers, it was thought. The matter is being investigated.



Elk Meadows, One of Nature's Beauty Spots on the Route of the Automobile Road That Loops Mount Hood: The Snow-Capped Peak of the Mountain can be Seen Towering over the Tops of the Intervening Pines

LOOPING MOUNT HOOD

By S. GERTSMON

WHEN the automobile road, looping Mt. Hood, in Oregon, now under construction, is completed in 1924, the tourist who is so fortunate as to include Oregon in his itinerary will traverse 173 miles of scenic grandeur, not to be equaled the world over.

It is only after many efforts, and the coöperation of Multnomah and Hood River counties, through which this famous loop passes, that the building of a $500,000 highway around Oregon's famous mountain has become an assured fact.

The Mt. Hood loop road is reached from Portland by way of Columbia Highway to Hood River, over 65 miles of never-to-be-forgotten wonders. One

Multnomah Falls, on the Columbia River Highway, Another of the Many Scenic Beauties to be Found near Mount Hood

passes, in succession, such interesting points as the Vista House at Crown Point, Multnomah Falls, Wahkeena Falls, Oneonta Gorge, Horsetail Falls, St. Peter's Dome, Bonneville Fish Hatchery, and Columbia Gorge Park. At the left, winds the Columbia River. At the right, and always in view, looms Mt. Hood, 11,225 feet high—a pure-white crystal set in a sea of blue.

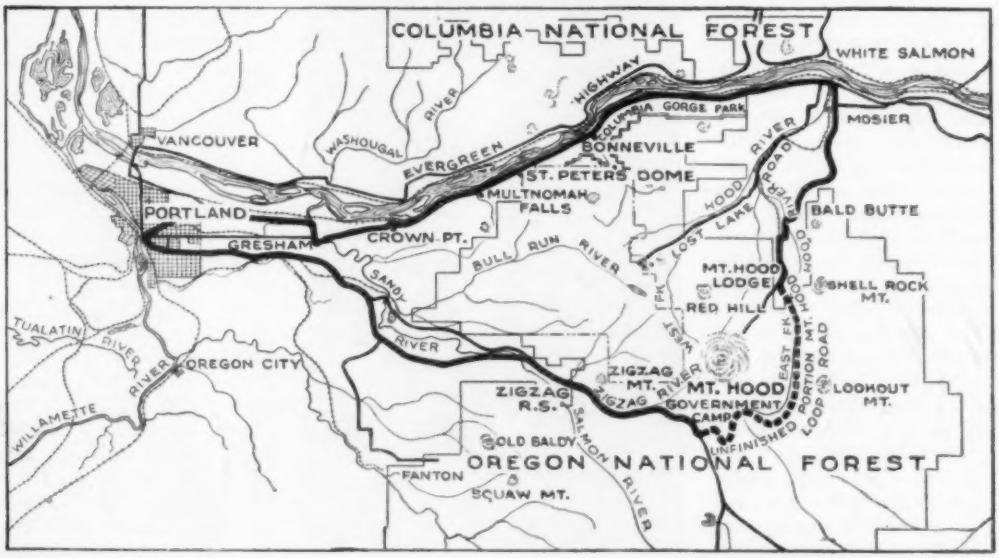
At Hood River, the Columbia Highway is abandoned for the Mt. Hood loop road. Here, the road follows the Hood River and its east fork for 22 miles to Mt. Hood Lodge, then rises for 19 miles to Bennet Pass, and continues into the Oregon National Forest. Six and one-half miles from the

lodge the road crosses the east fork of the Hood River, skirting the east side of Elk Mountain, where it crosses several glacial streams from Mt. Hood before reaching the highest point of the loop, an elevation of 4,675 feet. From Bennet Pass, the road descends gradually, skirting the high southeast slopes of Mt. Hood, a distance of 10 miles to Government Camp, following, in a general eastward direction, the old Barlow Road, over which the early pioneers fought their way into the Willamette Valley. From here the road continues in its descent to the national-forest boundary at Zigzag Ranger Station. From this point, the southeastern extremity of the loop road, the tourist may return to Portland, a distance of 45 miles, by way of Gresham, with the choice of three highways entering the City of Roses.

Looking across Lost Lake from Gifford's Point, Located near the Loop Road Encircling Mount Hood, Which can be Seen in the Background

At present, of the entire distance from Portland and back, circling Mt. Hood, 80 miles are paved, 22 miles macadamized, 14.5 miles partly graveled, 40 miles are dirt road, and 17 miles cleared but not graded. Twenty-two are being macadamized this year.

Forest-service contracts for sections of the Mt. Hood loop road call for a minimum width of 16 feet, not including ditches. The maximum grade allowed is 6 per cent, but none has yet been built to exceed 5 per cent.



Key Map, Showing the Route of the Loop Road Which Begins at the Hood River and Winds through 173 Miles of the Mount Hood Region, with Columbia Highway Completely Encircling the Mountain, and Finally Returning to Portland, Oregon

Chiefs of the Colonial Troops, Who Served in France So Gallantly during the War, Recently Visited Paris. They are Here Shown Gathered to Decorate and Honor the Grave of the French Unknown Soldier, Which Is near the Famous Arc de Triomphe, in the Champs Elysées. They were Accompanied by a Number of French Officials

CHIEFS OF COLONIAL TROOPS VISIT FRENCH CAPITAL

Twenty-eight chiefs of the colonial troops, who served so gallantly in France during the late war, recently visited Paris. All colored, they came from the French African dependencies, from the Sudan, from Mauretania, from Guinea, from Dahomey, and from the Congo. Clad in gorgeous costumes, they gathered, one day, at the Arc de Triomphe, in the Champs Elysées, where is located the grave of the French unknown soldier. This they decorated in the course of a ceremony participated in by several French officials.

SMOKESTACK BUILT SPIRALLY TO REDUCE WIND STRESSES

By building a brick smokestack in the form of a long spiral, with about a quarter of a turn in its length, it is obvious that stresses caused by a wind blowing against it must be decreased, for it will not present as great an area of direct resistance to the wind as if it were built with four vertical sides when the wind is blowing at right angles to one of these sides. A spiral stack of this kind has been built in England in connection with a small factory. The wind can never strike a side of the stack at right angles along its entire length.

Spiral Smokestack, Built in England, with a Quarter Turn from Bottom to Top, Causing Less Resistance to the Wind than if Built with Vertical Sides

MESSAGE-CLEARING HOUSE AT NEW YORK TERMINAL

Above: The Message-Exchange Booth at Grand Central Terminal, New York City. A Revolving File of Patrons' Names Is at the Left. Left: The "Green Cap" Taking a Message

A clearing house which will deliver or exchange messages by phone, wire, or mail, has been inaugurated in the Grand Central Terminal, New York City, to assist the traveler who may find it inconvenient to attend to these details himself. It is only necessary to call an attendant, made conspicuous by a green cap. He will telephone a message to any office, make a business engagement, or arrange other matters. A standard fee of 10 cents is charged for all services.

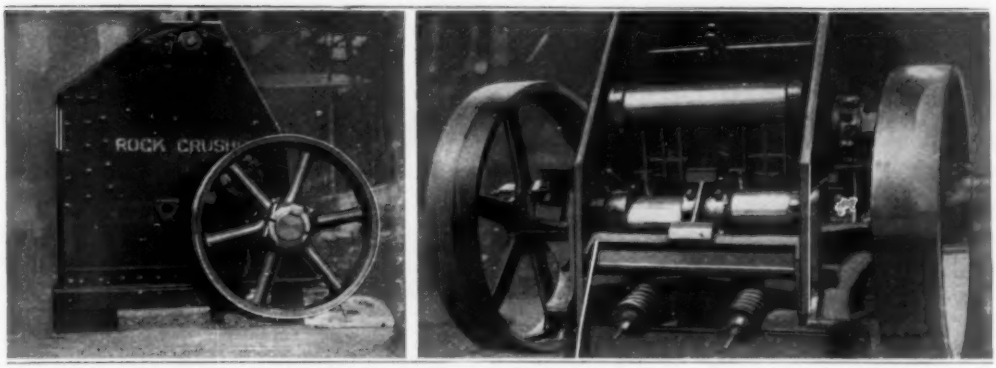
¶An inland system of low-speed wireless stations is about to be established by the government in India. This will form part of the British imperial wireless system when it is in operation.

IMPROVISED PLATFORM BUILT TO DRIVE POSTS

Driving posts in water lapping his stretch of road proved a disagreeable task for a South Dakota county commissioner until he thought of building a platform from his farm wagon. It took him only an hour to turn out the finished product, which consisted of several thick boards, chained to the bottom of the wagon, with a small platform at the outer end. This enabled him to hammer the posts more efficiently and with more comfort.

The grade at this point was threatened by wave action and the commissioner decided to build a fence using wire netting on both sides of the posts and filling the space between with straw. The space between the fence and the grade will then be filled in with earth. All the logs and other material needed for this improvement were conveniently carried in the same wagon from which the platform was built.

A County-Road Commissioner of South Dakota Standing on the Makeshift Platform Which He Built to Enable Him to Drive Posts in the Water



At the Left can be Seen the Gigantic Rock Crusher Which Has a Capacity of an Entire Wagonload at One Time. At the Right is Shown the Interior of the Crusher, Displaying the Pulverizing Mechanism

LARGEST ROCK CRUSHER MADE HOLDS FULL WAGONLOAD

Taking a full wagonload of rock in its maw at one time is the performance of what is claimed to be the largest rock crusher in the world. The huge machine was recently completed by a Pennsylvania concern, and delivered to a construction company operating in North Carolina. Considerable publicity was given the mammoth crusher during the time it was being manufactured, and when it was finally loaded on a flat car for shipping, the inhabitants of the little town where the machine had been built turned out en masse, in celebration of the record-breaking event.

STEREOSCOPE OF SMALL SIZE AS AID TO SALESMEN

Salesmen may now invoke the aid of a small stereoscope for the purpose of persuading the prospective buyer, a tiny, compactly folding outfit having been recently introduced. The innovation is approximately the size of an ordinary

The Stereoscope Folded, as Shown Above, Occupies No More Space than a Cigarette Case. At the Right It is Opened for Displaying Pictures

cigarette case, thus easily fitting into the pocket, and includes space for 10 photographs of the goods being sold.

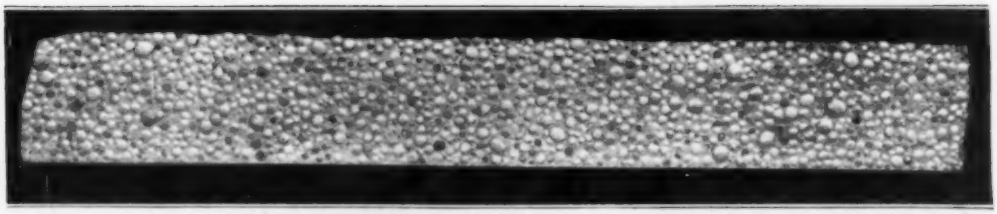
PRODUCE ICE SLED TO CARRY PASSENGERS AND FREIGHT

Difficulties presented when the waters of Green Bay, in Wisconsin, are frozen over, have been overcome in some measure by a man from that state, who has designed a freight and passenger-carrying ice sled for service between Sturgeon Bay

Ice Sled for Passengers and Freight, Showing the Propeller, Engine, and the Iron Steering Runner

and Marinette. The sled is 12 feet in length and has a high-powered automobile engine mounted on it, which drives an 8-foot airplane propeller. A speed of 60 miles an hour was attained last season on experimental trips with the conveyance, which is steered by an iron runner fastened to and extending in front of the sled.

Great Britain's standing timber, greatly reduced by exigencies of the war, is being gradually restored. The government has appropriated a sum of money sufficient for the afforestation of 150,000 acres of new land. The total number of plants set out in 1921 was 12,805,000, and consisted of pine, spruce, larch, and fir.



Slab of New Building Material Composed of Cement, Sand, and a Substance Similar to Paraffin Wax, Showing Its Air-Cell Structure: The Other Side of the Slab is Backed with Wire Netting

NEW-PROCESS CONCRETE MADE IN SHEETS

By ALLEN P. CHILD

A NEW JERSEY manufacturer has recently developed an interesting building material in sheet form, 1 inch in thickness, which is made of cement and sand, and reinforced with galvanized-wire netting. In making these slabs, 3 cubic feet of cement and 1 cubic foot of sand are mixed with 7 cubic feet of small pellets of a material similar to paraffin wax. The necessary amount of water is added, and this is worked in a mixer to the consistency of ordinary grout and then poured into a steel form in which the wire netting is placed. About 16 hours are required for the cement to set hard enough to permit the removal of the material from the steel forms without breaking. The slabs are then placed in vertical rows, on steel cars, which are pushed into a big tank and there exposed to steam. The steam heats the slabs rapidly; the waxlike material melts and runs to the bottom and is conveyed to other tanks. About one-half to three-fourths of the material is extracted in this manner. In order to get rid of the balance, the steam is superheated to a temperature of approximately 300° Fahrenheit, the remaining chemical evaporating and escaping, together with the steam, through a pipe on the top of the tank, and into an ordinary coil condenser. It takes 24 hours to remove all traces of the chemical from the slabs by the steaming process. After being cooled for a few hours, the slabs are placed in a steam curing room, where they are kept wet and hot. Two or three days of steam curing give them the necessary strength, and they can now be stacked outside and are ready for building purposes.

The slab resulting from this process is nothing but a skeleton of cement concrete, and the setting process, though interrupted during the extraction of the chemical, goes on afterward as in any

Construction of a Roof Deck with Slabs of the New Kind of Reinforced Concrete: These Slabs Are Only an Inch Thick, and Are of a Porous Structure. When Used for Such Purposes as Roofing or Flooring, the Slabs are Covered with a Thin Cement Finish

other concrete products. The melting of the waxlike material makes possible the formation of a very porous and light slab, but one of great strength. It is claimed that the crushing strength of the slabs is 600 pounds to the square inch, but this is not sufficient for many purposes. In such cases the slabs are covered with a cement finish, varying from 1/16 to 1/2 inch in thickness. The reinforcing metal then takes the tensile stresses, and the top finish takes the compression stresses as in reinforced concrete. The slabs weigh only about 55 pounds a cubic foot. When used in building stucco houses, they are nailed to wooden studs with the rough face out, and this serves as a base for the stucco. Nails are driven through them easily without breaking the material. On account of the air-cell structure, they are good heat and sound insulators, and as exposure to high heat, steam, or water does not affect their strength, they are particularly useful where fire-resisting qualities are needed. They have also found use in making roof decks and flooring, as well as for tile floors in bathrooms, hallways, and shops.

Dwelling, with Siding Made of the New-Process Concrete: The Outside Face of the Slabs will be Covered with Stucco, Their Air-Cell Structure Making Them Good Heat and Sound Insulators

EMERY-WHEEL ATTACHMENT FOR FARM TRACTORS

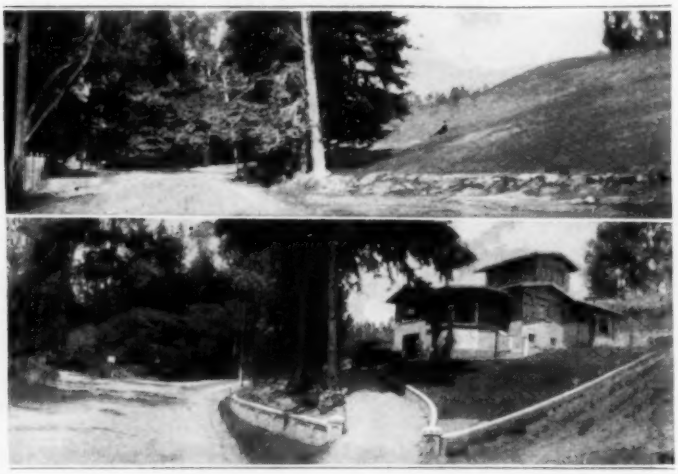
Emery-Wheel Attachment for Use on Farm Tractors: The Belt Pulley has been Taken Off, and the Grinding Wheel Mounted in Its Place. Inset: Close-Up of the Emery Wheel being Used for Grinding

A special emery-wheel attachment has been devised for use on the track-runner type of farm tractor. The regular belt pulley is taken off, and the emery wheel is put in its place. It is particularly useful to the farmer when the tractor is hauling a mower, the knives of which can be sharpened at any time on the emery wheel without any more than a short interruption of the work. The wheel may also be used for sharpening any other tools or implement parts.

¶The British admiralty's leader cable that runs from Portsmouth about 20 miles out to sea, has been used for the first time by a merchant vessel, the steamship "Orbita." This is the only British merchant ship that is as yet fitted with the electric instruments that are necessary for the use of the leader cable.

HOUSE BUILT SINGLE-HANDED BY INEXPERIENCED MAN

Utilizing his spare time during a period of three years, a member of a high-school faculty in California has finally completed a home which contains all modern improvements. The piece of land upon which the house was erected was purchased by the amateur builder in 1917. He was at that time living on a ranch near the ocean, when, observing the fine drift logs that were constantly being cast upon the beach, he decided to salvage them. Accordingly, he gathered a great number of the logs and then rigged up a crude sawmill, using an old automobile for power. With this outfit, the novice made all of the floor joists, posts, girders, rough boards, etc., for the contemplated home, and then, with the aid of the old motor car, hauled the lumber to his vacant lot.

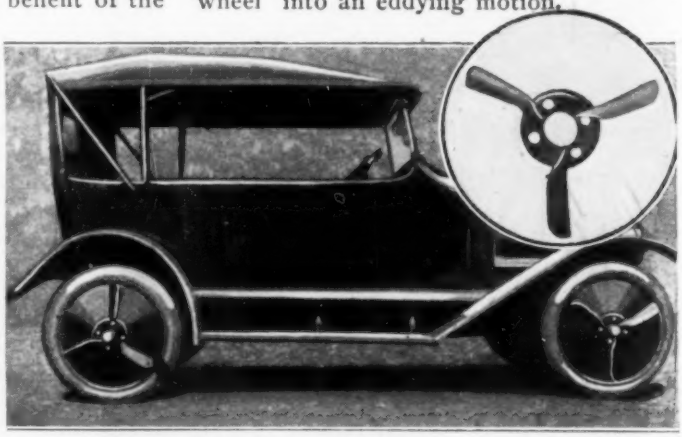


Above is Seen the Vacant Lot as It Appeared Three Years Ago; Below, the Completed Modern Home, Together with the Improved Property

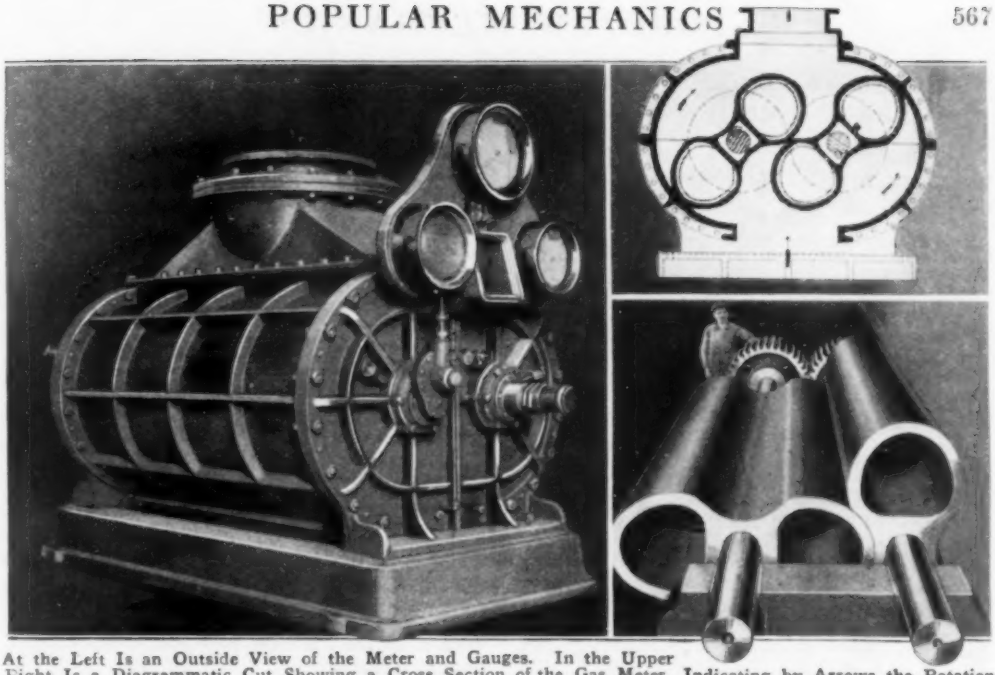
Although he had no previous experience in any of the building trades, he next excavated for, and then put in, a concrete foundation. The construction of the house was slowly accomplished, single-handed, with the exception of the electric wiring, roofing, and the mason work in erecting the chimneys. The completed dwelling has hardwood flooring, a furnace, and hot-water heat, tile drain boards in the kitchen, and a tiled floor in the bathroom, which includes a shower. The proud owner claims that his total expenditures amounted to only $2,000, not counting his own labor, and places an estimate of $12,000 as the present value of his property.

SMALL FAN ATTACHMENT COOLS AUTOMOBILE DISK WHEELS

From the nature of their construction, disk wheels do not get the benefit of the cooling properties of the air to the same extent as do open wheels. To counteract this disadvantage, a French inventor has patented a device for increasing the air circulation over the face of the disk by means of a fan. This can be applied to any disk wheel without necessitating any change beyond the drilling and tapping of a few holes. The fan is so shaped that it is protected by the wheel itself from any damage when the car runs along a sidewalk curb, or against any other object that could reach inside the mudguards. The fan has propellerlike blades, but does not revolve independently, simply setting the air adjacent to the wheel into an eddying motion.



Automobile Disk Wheels Fitted with Fan Blades That Maintain a Rapid Circulation of the Air for Cooling the Disks: Inset Shows an Enlarged View of a Set of Fan Blades Connected to the Center of a Disk



At the Left Is an Outside View of the Meter and Gauges. In the Upper Right Is a Diagrammatic Cut Showing a Cross Section of the Gas Meter, Indicating by Arrows the Rotation of the Two Impellers and the Inlet and Discharge Openings. Lower Right Is a Picture of the Two Impellers

POSITIVE BLOWER MECHANISM BASIS OF NEW GAS METER

A new meter for air or gas, now on the market, utilizes the principle of the well-known positive pressure blowers. In the new meter the impellers are constructed of reinforced aluminum and mounted on special roller bearings, so that they just clear the inside of the casing, making it unnecessary to provide internal lubrication. Due to this clearance, there is slippage of the gas back from the discharge to the intake, which, having been found to average about two per cent, is automatically corrected in a special recording gauge permanently attached to the meter. The meter also corrects for temperature and pressure, so that the gauge reading will be in cubic feet of gas referred to standard conditions. The cost is said to be considerably less than that of many older types of meters, which it equals in accuracy and efficiency.

ANGULAR-NOZZLE SPRAYER FOR UNDERSIDE OF LEAVES

Spraying a garden has been facilitated by the introduction of a portable compressed-air outfit, which is manufactured by a New York concern. In operation, the contrivance is hung over the shoulder of the user and a long angle nozzle extends down to the underside of the plants. By this method, the under surface of the leaves, which is the starting point of most plant diseases, is thoroughly treated in an easy and rapid manner.

At the Upper Left is Shown the Manner of Using the Angular-Nozzle Sprayer to Reach the Underside of the Plants. At the Upper Right is Seen a Close-Up of the Sprayer, While below It is Shown the Nozzle

¶A bill has been introduced in the U. S. Senate to authorize the President to give Poland six American warships that, under the terms of the Washington agreement, would have to be scrapped.

RISKY METHOD OF CLIMBING A PEAK IN SWITZERLAND

Mountaineering in the Swiss Alps furnishes many thrills, but few equal to that in connection with the scaling of the

Climbing One of the Peaks of the Kreuzberg in the Upper Rhine Valley, Switzerland, by Means of Ropes Suspended from an Overhanging Rock

peaks of the Kreuzberg in the valley of the Upper Rhine. There are eight peaks, the lowest being 5,673 and the highest 6,207 feet above sea level. The ascent and descent have to be made with ropes suspended from a large protruding bowlder. With the help of the ropes and the use of his feet, the mountaineer negotiates the almost vertical face of any of these peaks.

SHORTER ATLANTIC PASSAGES WHEN NEW PORT IS BUILT

At none of the ports in England at present used by Atlantic liners can a vessel enter and discharge passengers and cargo at any state of the tide or weather. To avoid the loss of time often caused by this condition, parliamentary powers have been obtained to build a port at St. Just, near Falmouth, on the coast of Cornwall, where there will be a depth of 44 feet at low water, so that the largest vessels afloat could dock at all states of the tide. By this route passengers could reach London eight hours before those landing at Southampton, and on the western journey the St. Just passengers could remain in London eight hours longer than those traveling via Southampton.

ILLINOIS ZONING LAW MADE VOID BY COURT DECISION

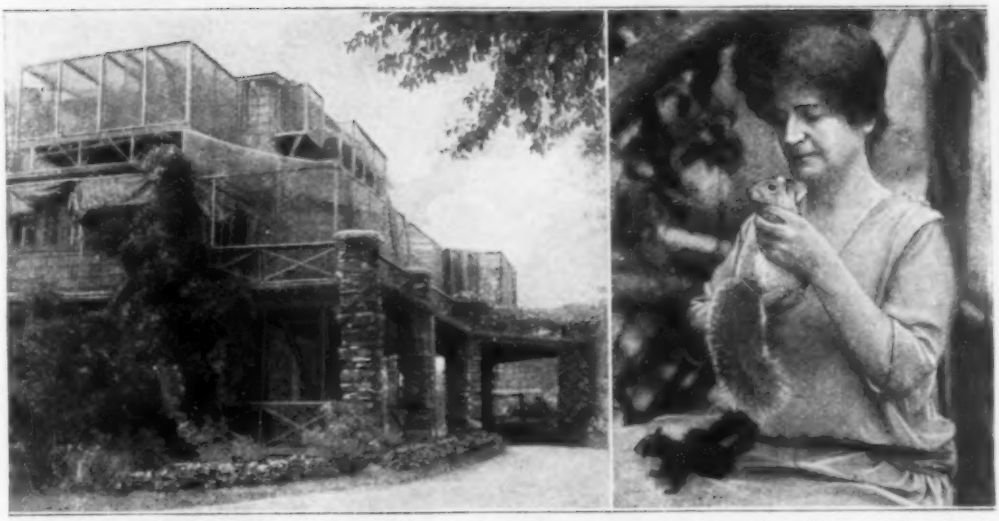
The validity of the proposed Chicago city-zoning ordinance is now in suspense on account of a recent ruling of the state supreme court. One basic principle of modern zoning ordinances is that they are not retroactive, but the court decision goes further, for it states that: "An ordinance is void which prohibits one citizen from conducting a particular kind of business in a certain locality and permits another to engage in the same character of business in the same locality merely because the latter had established his business before the ordinance was passed."

HAND SPEED RECORDER GIVES READINGS AT A GLANCE

For use in shops or manufacturing plants where the speed of machinery, or surface and cutting speeds, are of prime importance, a reliable hand recorder is now available. The instrument gives the readings direct on a dial without the ne-

This Hand Speed Recorder Gives the Readings Direct on the Dial, and can be Used for a Large Range of Speeds

cessity of watch-timing or calculation. A gear shift is provided that gives the instrument an ability to record speeds and feeds over a remarkably wide range.



The Picture on the Left Gives the Front View of the Country Home of a New York Woman, Transformed by Her into a Squirrel Farm. In the Photograph to the Right, She is Seen Fondling Two of Her Prize Pets

FINEST SQUIRREL COLLECTION KEPT IN BEAUTIFUL HOME

Three hundred and fifty squirrels, from all parts of the world, considered the finest collection of these animals in existence, are housed in the beautiful country home of a New York woman at White Plains. The cages extend from the windows and are fitted with every comfort. The collection is said to be worth a fortune.

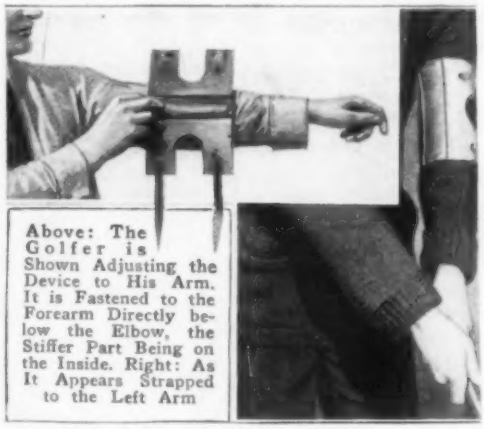
CORRUGATED FINGER BOARD HELPS VIOLIN PLAYERS

Teaching of the violin is found to be very much facilitated by the use of a corrugated finger board, the invention of a Chicago teacher. At the point to be fingered for each note of the scale is a slight ridge, and this is said to greatly aid the learner in acquiring correct fingering. The corrugated finger board is removable, and when sufficiently expert, the student can dispense with it. It is also made for use with the violoncello.

Corrugated Finger Board That Makes Violin Playing Easy: When the Student with Its Aid has Acquired Proficiency in Fingering, It can be Removed

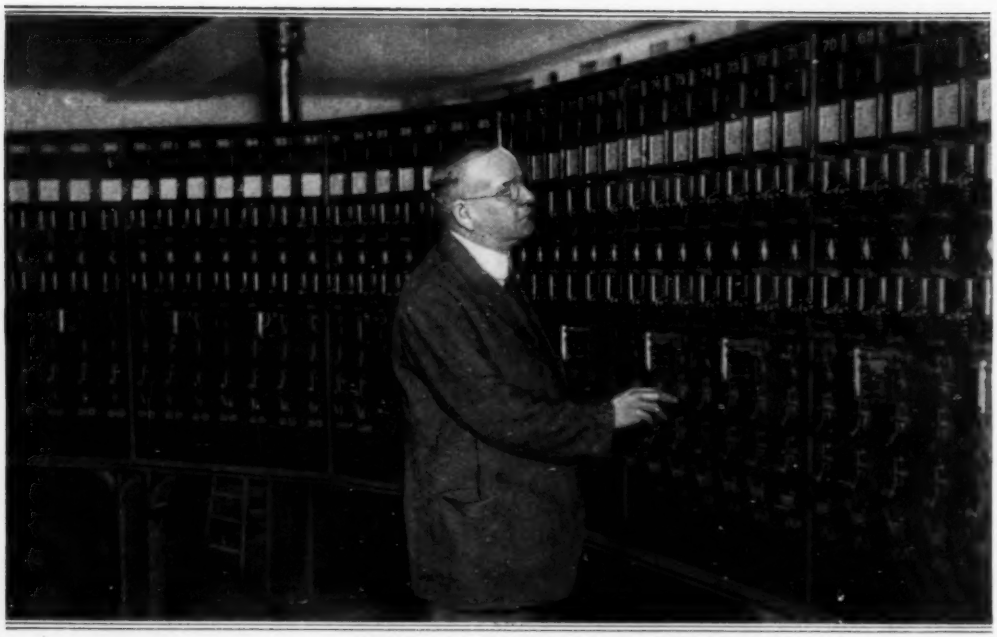
GOLFERS CANNOT OVERSWING USING LEATHER DEVICE

A leather device, to hold the arm in exactly the proper position while swinging is now available for the aid of golfers anxious to improve their game. The device, which is strapped to the left arm, allows the arm to be bent backward the necessary distance, but prevents too much bending.



Above: The Golfer is Shown Adjusting the Device to His Arm. It is Fastened to the Forearm Directly below the Elbow, the Stiffer Part Being on the Inside. Right: As It Appears Strapped to the Left Arm

¶A big wireless station is being built near Saigon, in French Indo China, for direct communication with the stations at Sainte Assise in France, and Tananarivo, in Madagascar. The necessary current will be furnished by a generating station near Saigon that has a capacity of 3,000 kilowatts.



The Relay Receiving Board of the New York Fire-Alarm System, Which Distributes the Alarm to the Proper Stations, with Little Loss of Time, and Thus Assists in Speeding Up the Answering of Calls

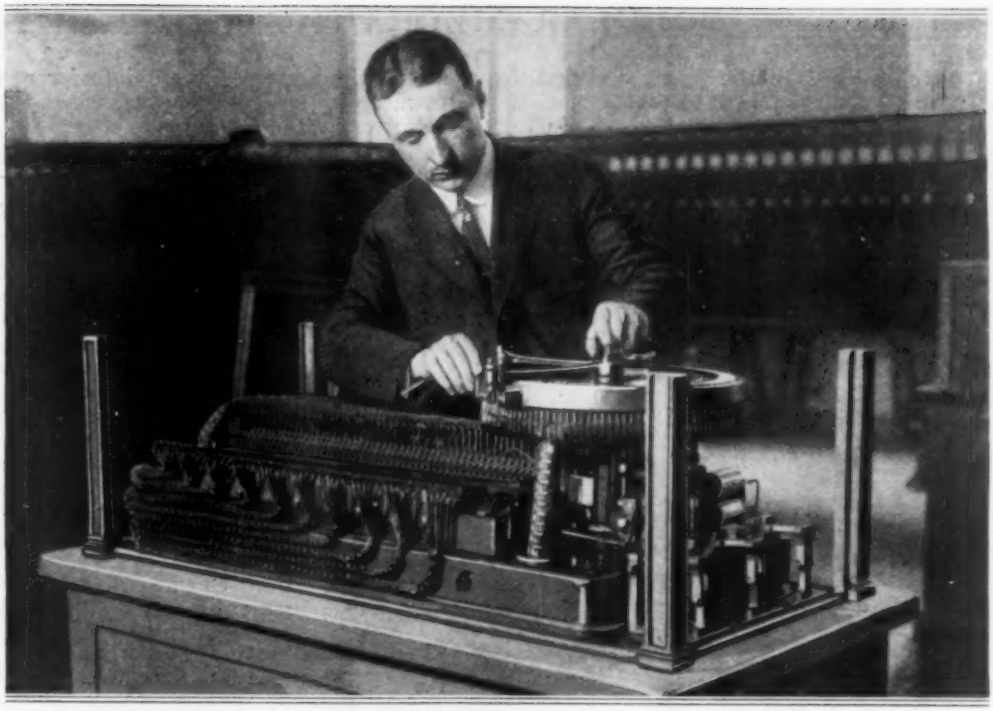
MODERN FIRE-ALARM SYSTEM FOR NEW YORK

NEW YORK CITY has just inaugurated a new fire-alarm system for the Borough of Manhattan, that has taken a number of years to complete, at a cost of $1,500,000. The system has been so perfected that it takes only 10 seconds for an alarm to pass through the central station and reach the station intended to answer the call.

The central station has 217 working box circuits connecting it with the 1,528 street-corner alarm boxes, involving the use of 350 miles of cable and 17,000 miles of wire for the intricate telephone and telegraph system that interconnects the alarm boxes, central station, and fire houses.

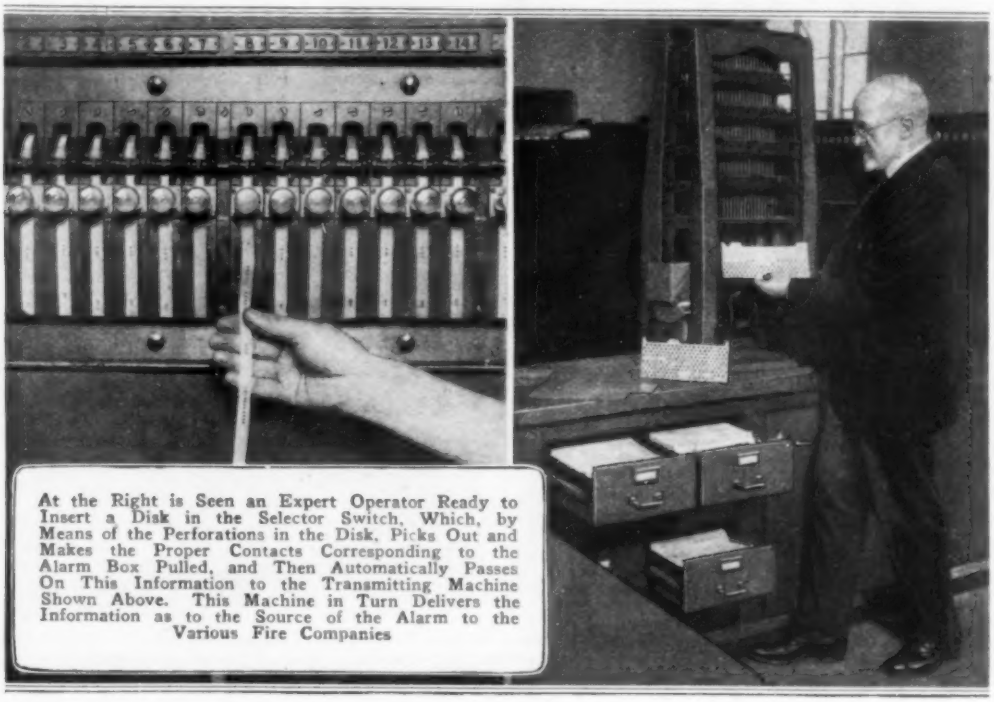
Old Tower and Bell, Relic of Early Fire-Alarm System, Still Standing in Mount Morris Park, New York City, Which at One Time Had a Number of These Bell Towers

When it is desired to send in an alarm, the person goes to one of the fire-alarm boxes that are located at every other street intersection, and, noting the instructions on the door, turns the handle until the bell rings. A mechanism is thereby set in motion that transmits to headquarters four complete rounds of the code signal indicating that particular box. After the first round has been received at the central station, the dispatcher takes from a file a perforated card corresponding to the box sending in the alarm, and places it in the selector switch. Directly after the second round from the box, he presses a key and sets in motion the automatic-transmitter control, which instantly



The Expert in Charge of the Central Fire-Alarm Station in Central Park, Examining the Mechanism of the Automatic Selector Switch, Which Does Its Work with Accuracy and Dispatch, in Spite of the Complicated Appearance It Presents

sends the alarm to all fire houses, during the day, and to all companies due at the station on the first and second alarm, at night. This signal is thus transmitted twice over what is called a "combination circuit," and once over what is called the "gong circuit," to all the engine houses. The fire companies are under instruc-

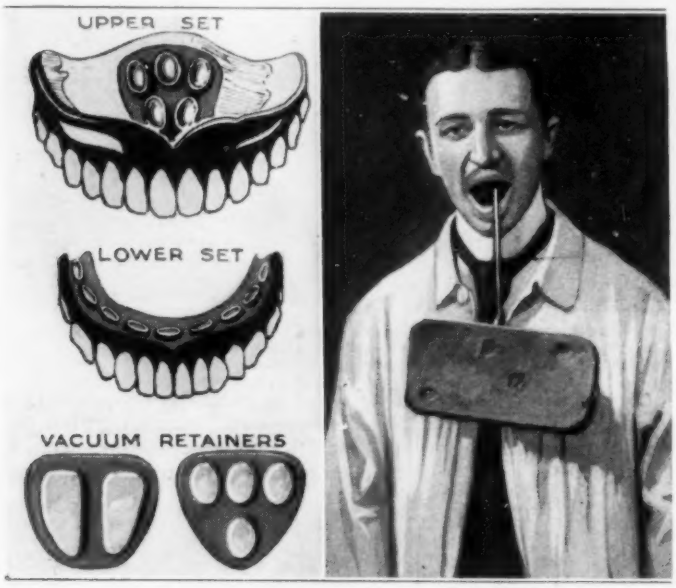


At the Right is Seen an Expert Operator Ready to Insert a Disk in the Selector Switch, Which, by Means of the Perforations in the Disk, Picks Out and Makes the Proper Contacts Corresponding to the Alarm Box Pulled, and Then Automatically Passes On This Information to the Transmitting Machine Shown Above. This Machine in Turn Delivers the Information as to the Source of the Alarm to the Various Fire Companies

tion to proceed to the point designated by the alarm, according to which station it is nearest. When the call comes in to the central station, it is heard and seen by the dispatcher and automatically registered to avoid error. The alarm boxes are of the succession-noninterference type, meaning that, if two or more boxes on the same circuit are pulled for a fire, each box will transmit its signal of the alarm to headquarters with no interference to the signal from any other box.

NONSKID FALSE TEETH USE VACUUM-CUP IDEA

The problem of making false-teeth plates that would be comfortable and stay in place, has been largely one of contact between the cup flange of the plate and the mouth, rendered difficult because of the irregular contours of individual mouths and the presence of rough membrane. A recent invention has apparently successfully made use of the vacuum-cup principle, familiarly used on the treads of nonskid automobile tires and some athletic shoes, for the alleviation of this difficulty.

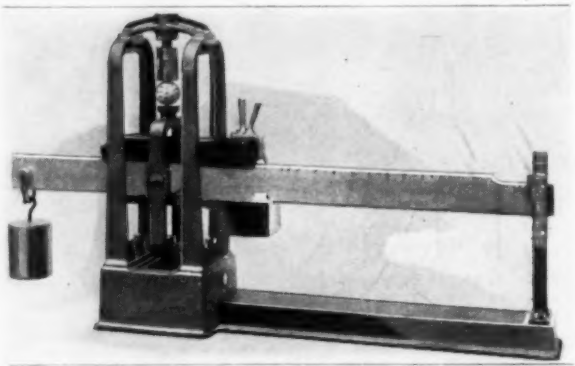


Left: Close-Up of the Vacuum-Cup Retainers, and an Illustration of How They are Applied to an Upper and Lower Plate. Right: Man with Weight Attached to Upper Plate

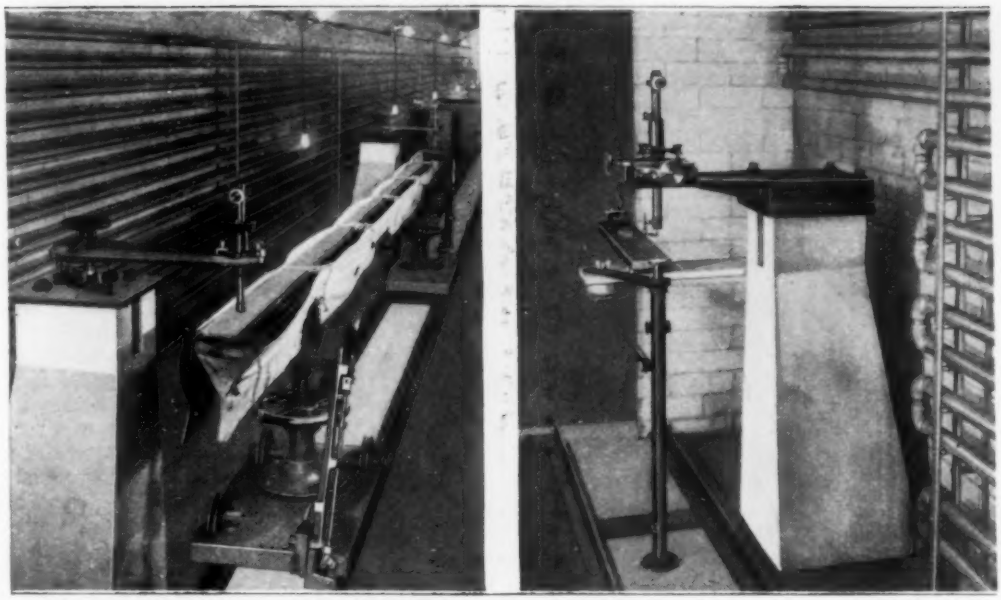
The rubber vacuum cups can be fitted to any style of artificial set of teeth. They are made of flexible high-grade rubber and vulcanized to a reinforced rubber backing, which combines rigidity with the essential flexibility. The vacuum cups have been found to retain their life and effectiveness for a long time, and the plates to stay so securely in place that they have not become dislodged by violent coughing, sneezing, or laughter. They may be as easily removed as the older types, when desired. Many persons with troublesome mouths have already been benefited.

MACHINE FOR TESTING RESILIENCY OF NEW GOLF BALLS

The elasticity of golf balls, or other balls having solid-rubber cores, is tested by a new machine of English make. The machine consists chiefly of a standard, bolted to a baseplate, with a steel yard supported by the standard. The yard is notched for different positions of poise, and a deflection scale is arranged at the end of the beam. Two platens hold the ball. Variations of .001 inch are discernible.



In This Machine for Testing Resiliency, the Ball is Placed between Two Platens, and the Variation in Diameter is Read on a Scale at the End of the Beam



Left: Part of Tape Tunnel, Showing the V-Shaped Trough between Two of the Concrete Stands, Each Carrying a Microscope. Inside the Trough, Packed in Ice, Is a Standard Meter Bar. Right: One of the End Stands with the Instrument for Positioning One End of a Tape When It is being Standardized

TAPE TUNNEL OF THE BUREAU OF STANDARDS

One of the least known of the Bureau of Standards' multifarious activities is carried on in the so-called tape tunnel of that institution. Here the tapes used in the measurement of land and water by the Coast and Geodetic Survey, the International Boundary Commission, and other government bureaus, are standardized, all measurements being deduced from one of the original prototype meters which were deposited at the bureau when it was established in 1901. Concrete stands, each carrying a microscope at a convenient height for observation, are lined up at 5-meter intervals along the tunnel for a length of 50 meters. The center one of these intervals is similarly subdivided with stands spaced 1 meter apart. Here a 5-meter length is established by placing the standard meter bar in a V-shaped trough, wherein melting ice keeps the bar at zero centigrade, the temperature at which it is absolutely correct. The trough is mounted on a carriage that runs on a track so that the meter bar can be moved from microscope to microscope, each one being successively adjusted, by means of its cross hairs, to the exact meter length. When all are thus adjusted, a 5-meter bar is correctly standardized, and is then used in a similar manner to adjust the 5-meter intervals successively until an exact 50-meter length between the first and the last of the microscopes is established. At each of these end microscopes is an instrument for transferring this measurement to a ball set into a ring in the floor. Resting on each of these balls is a vertical post which carries below the microscope a support for the ends of the tapes when they are being standardized.

IMPROVED BLOWTORCH USES KEROSENE OR GASOLINE

A combination blowtorch offers refinements in design for the convenience of users of such devices. An absolutely blunt burner needle, fitting into an open channel, is so constructed that it cannot easily be removed. Interchangeable gasoline and kerosene burner blocks are screwed into the burner or filler plug. Cleaning needles are kept in a pocket in the hollow handle.

"KEEP THE FORESTS GREEN," KEYNOTE OF PARADE

Floats Representing Smokers' Articles Carried in a Seattle Parade: Signs Warned against Their Careless Use in Forests

Assisted by prominent business men, automobile clubs, and civic organizations, Seattle recently held a parade protesting against an increase in forest fires which has come about, it is believed, because of the popularity of mountain automobile travel.

In addition to signs admonishing motorists and others to "Help Prevent Forest Fires," "Keep the Forests Green," etc., floats were used to further emphasize these points. Among the more interesting was a large pipe carried by two mountaineers, a large pasteboard match, and a cigarette. Each displayed a placard warning again the careless use of these articles.

DOG CLINIC IN NEW JERSEY OPENED BY KENNEL CLUB

With the sanction of the board of health, a kennel club at Closter, N. J., has opened a dog clinic for the purpose of inoculating the animals with rabies vaccine. The reason for the innovation is that an ordinance passed by the city council permits dogs so treated to run the streets unmuzzled. The injection is claimed to make the dogs immune to rabies infection for one year.

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A Great Dane being Bound Up Preparatory to the Injection of the Rabies Vaccine at the Dog Clinic of Closter, New Jersey, Opened by a Local Kennel Club

PROTECTION OF GRATE BARS BY AN ALUMINUM COATING

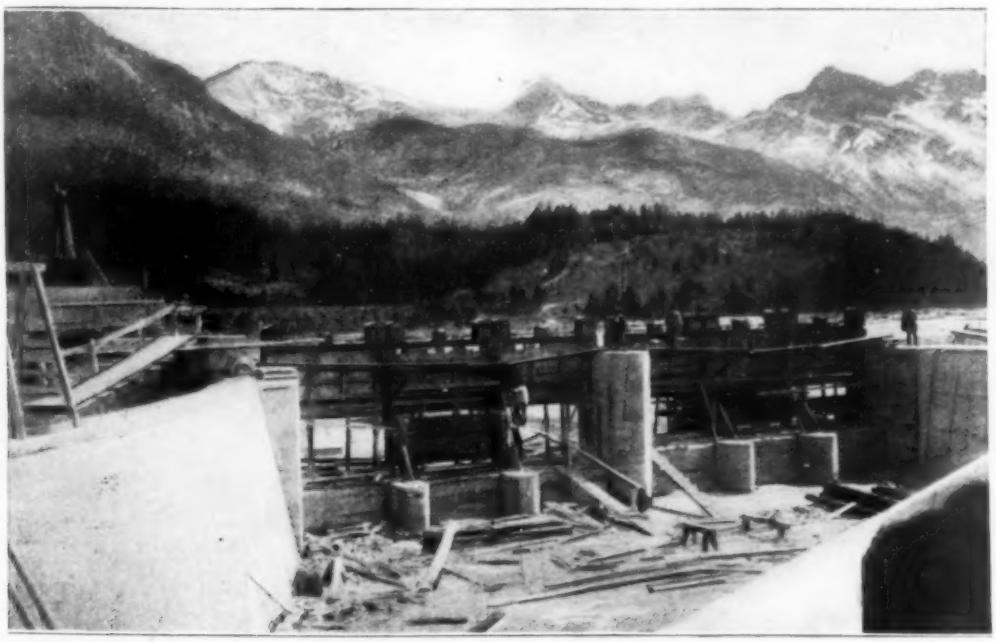
Tests made in Europe have shown that pieces of metal protected by an aluminum coating, as applied particularly to fire-grate bars and cast-iron stoves, give at least four times and, as a general rule, six times the service of untreated pieces. The aluminum is melted and is sprayed upon the articles treated, instead of being applied by the calorization process, well known in this country. Coated fire-grate bars, tested in locomotives, besides having their life greatly increased, allowed the clinkers to be much more easily removed than untreated bars. However, the general results of the experiments show that the protection by the spraying process is not as effective under high temperatures as that obtained by calorization. Further investigations are now being conducted.

¶It has been found that the use of nickel fluoride, in place of nickel chloride or sulphate, gives a finer-grained deposit of higher tensile strength and greater hardness in nickelplating.

ALPINE LAKES TO FORM LINK IN POWER PROJECT

Tunneling through the Rocky Mountain between the Kochel See and the Walchen See, in Bavaria: The View Shows the Operations being Carried On at the Walchen See Side, Which Is About a Mile Distant from Kochel See, and 650 Feet above It

There is in progress in Bavaria an engineering project which, when completed, will make that country practically independent of foreign sources of coal supply. By boring a tunnel about 2½ miles long through the Alps, a portion of the flow of the Isar River will be diverted into the Walchen See, a mountain lake some 7 square miles in area and very deep. This lake will be used as a storage reser-

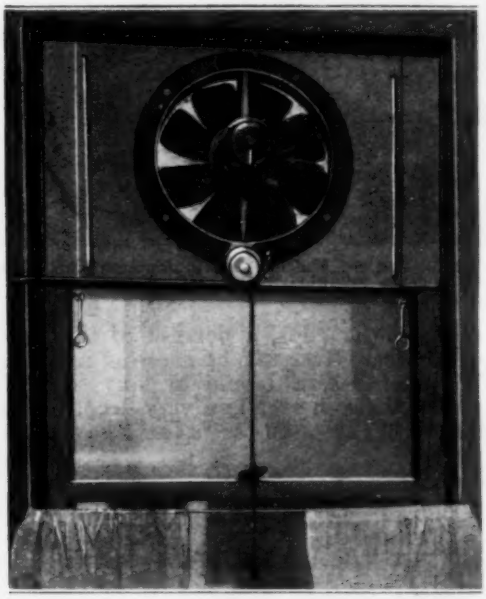


Building the Dam in Connection with the Development of the Power Plant That will Produce Enough Electric Current to Run All the Railroads in Bavaria, and to Supply Power for All Its Industrial Plants, and Light for All Its Cities

voir, and a second tunnel will lead the water to the Kochel See, less than a mile distant but 650 feet lower. This difference of elevation will make possible the development of sufficient electrical energy to operate all railroads and industrial plants in the country, besides furnishing light and heat for the cities.

KITCHEN-VENTILATING FAN IS EASILY INSTALLED

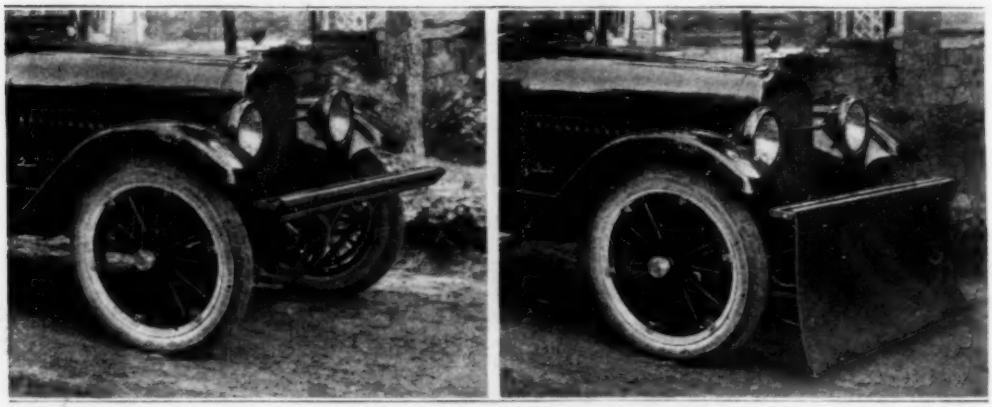
Smoke, odors, and hot stagnant air can be quickly drawn from any kitchen with the aid of a ventilating fan manufactured in Chicago. In installing the fan, no alterations or electrical work are required, as the outfit has an adjustable frame which can be fitted in any ordinary window casing and fastened by five screws. The window may be raised or lowered at will when the fan is not revolving, but still in place. Either alternating or direct-current reversing motors are available, for which power is obtained by a cord attachment to any socket, and which operate with no more consumption of current than is used by a 50-watt lamp.



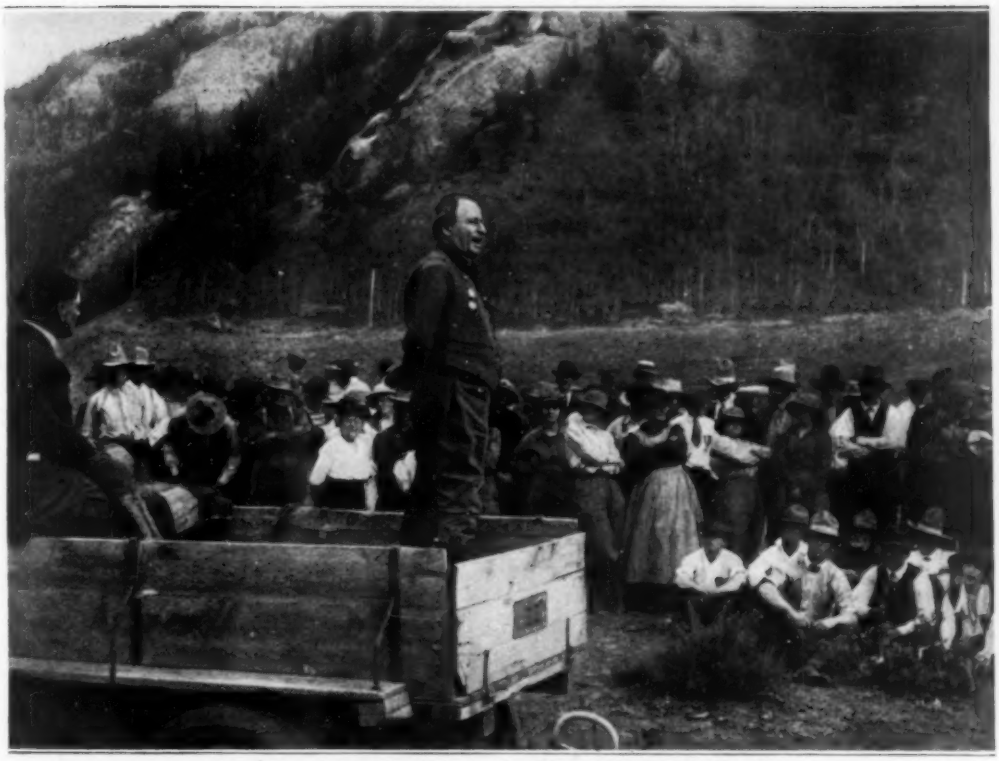
Kitchen-Ventilating Fan for the Removal of Smoke and Stagnant Odors, Shown Mounted in the Upper Section of the Ordinary Window

NEW AUTOMATIC LIFE-SAVING FENDER FOR AUTOMOBILES

To act in emergency as a life-saving fender, a substitute for the ordinary automobile bumper, occupying about the same space, has been demonstrated successfully in Alabama. The fender extends clear across the front wheels of the vehicle, and comprises parts that, when released by the operation of the emergency brake, automatically unfold a strong curtain, or flexible shield, which reaches to the ground. The result is that, if a person is struck by a vehicle equipped with this fender, the yielding cloth shield will push the person ahead of the car for the short distance that is required to stop the machine with the emergency brake. Though designed specially to be connected to the emergency brake, the fender may also be operated by the foot brake. After use, it is refolded and returned to its normal position by a lever mounted within convenient reach of the driver.



Two Views of the Automatic Life-Saving Fender, Showing, at Left, the Fender Folded Up and Looking like an Ordinary Bumper; at Right, the Curtain, or Flexible Shield, is Shown as It would be Automatically Unfolded by Striking Any Obstruction When Traveling. Any Person Struck is Pushed Forward until the Car is Stopped by the Emergency Brake

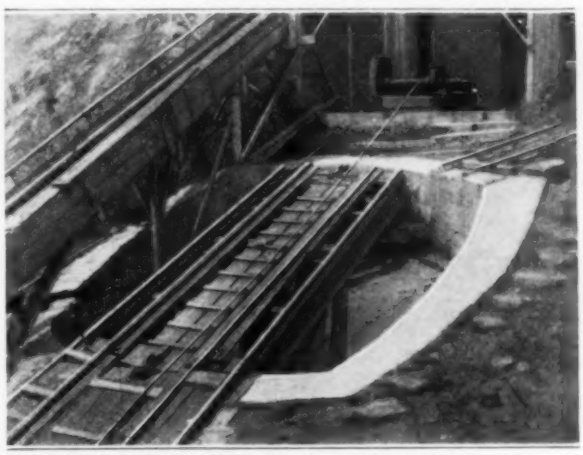


FAMOUS WILDERNESS PENETRATED BY HIGHWAY

CEREMONIES were held recently to celebrate the opening of the Hoback Cañon Highway, in Nebraska, which cuts through the heart of a wilderness famous in old-time western history and tradition. In the picture, the leader of the House of Representatives of that state is seen addressing a gathering at Jackson's Hole, designating one end of the newly completed highway which winds through what was formerly the "hang-out" of many notorious desperadoes of that section of the country. The swaggering poses assumed by some of the feminine members of the audience would seem to indicate that the dashing and independent spirit, so prevalent in the olden days, has passed from the male to the female branch of humanity.

INCLINED TURNTABLE FOR NARROW-GAUGE ROAD

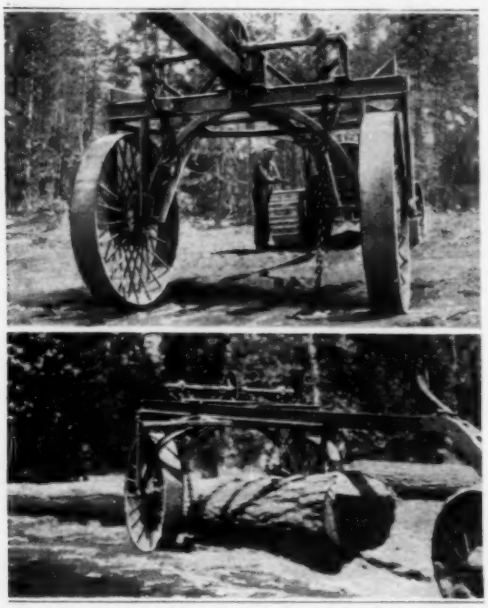
Turntables for railroads are usually located on level ground, but one of these, built for a narrow-gauge industrial road on Vancouver Island, B. C., is constructed on an incline of 35°. The motive power for the cars used on this railway is furnished by compressed-air winches and steel cables. About halfway up the grade, a turn of 60° is required, and here the turntable is installed. One winch pulls a car up to the turntable, whereupon another cable, coming from a winch at the head of the second stretch of track, is attached. The car is then turned to the other set of rails, and locked in position on the table while the cables are being changed.



Turntable Built on an Incline: At the Upper Right are Shown the Winch for Pulling the Car Up to the Turntable and the Tracks Leading to the Second Winch, Which is Located at the Top of the Incline

ALL-STEEL LOGGING WHEEL FOR TRACTOR USE

A California company is now using an all-steel logging wheel in connection with



Above: Close-Up of Logging Wheel. Below: Wheel under Pull and Log Raised

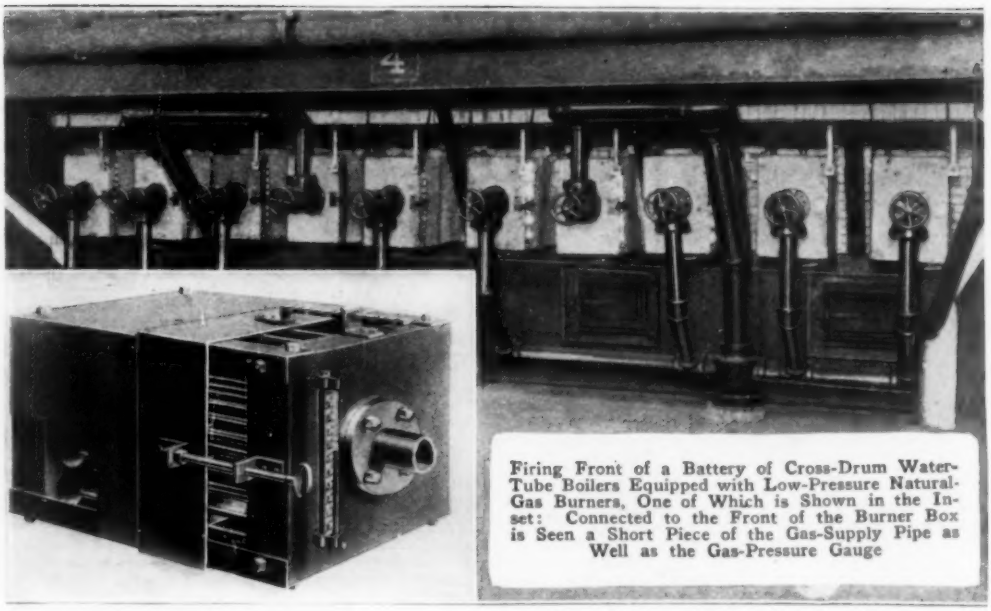
a crawler type of tractor. Aside from its all-steel construction, other features of the design are the wheels, 6 feet 6 inches high, with tires 10 inches wide and special bearings in the hubs, and a rack and pinion on the reach for raising the load under pull. The gear ratio is such that the load is readily lifted clear of the ground when the wheels are under pull and quickly dropped if the wheels tend to crowd the tractor on downgrade. The wheel has a capacity of 2,000 feet of lumber per load, and it has been found that when logging at a distance of 800 feet, at an effective tractor speed of three miles per hour, this equipment will easily deliver 9,000 feet of lumber per hour.

LARGE POWER PLANT OBTAINS EFFICIENT GAS BURNING

Evaporation tests recently concluded at the world's largest gas-fired boiler plant of 12,600 horsepower, seem to upset the quite prevalent idea, that natural gas can only be burned economically under high pressure. In this test, lasting 14 hours, with an average gas pressure of less than 6 ounces, and at boiler loads of 110, 214, and 302 per cent, an average gross efficiency of 87.8 per cent was obtained.

These excellent results are attributed mainly to a recently invented low-pressure type of natural-gas burner, as it was recognized that economical results could not be expected from the older types of burners, requiring higher gas pressure than is now generally available.

Crawler-Type Tractor and All-Steel Logging Wheel Engaged in Hauling a Large Log through the Forest in California: Note How the End of the Log at the Wheel is Held above the Ground



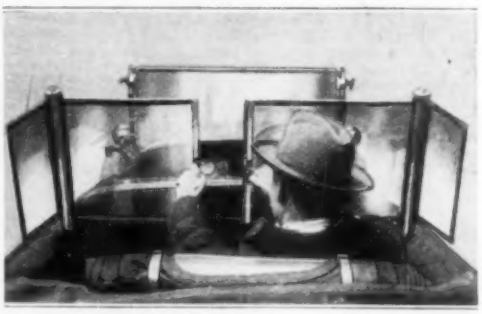
Firing Front of a Battery of Cross-Drum Water-Tube Boilers Equipped with Low-Pressure Natural-Gas Burners, One of Which is Shown in the Inset: Connected to the Front of the Burner Box is Seen a Short Piece of the Gas-Supply Pipe as Well as the Gas-Pressure Gauge

The advantages claimed for the new burner are: that it will operate efficiently at any practical boiler rating, with a gas pressure varying between 1 and 4 ounces; that back-firing is impossible; that the annoying vibration and roar of the high-pressure types is eliminated; that burning out of nozzles is prevented because of the low pressure, and that a nonoxidizing flame is produced.

The gas supply is connected to a cast-iron box at the front of the burner, from which lead a number of small pipes to the back or burning end, where the mixing plate is located. This is provided with holes corresponding to the number of nozzles. The whole is surrounded by a steel box, which, with the assistance of a telescopic slide, regulates the admission of air. A slight draft from the furnace supplies the necessary air.

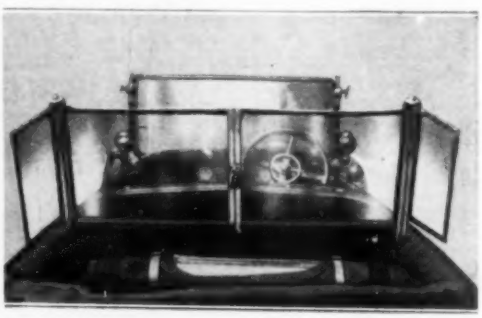
WINDSHIELD FOR REAR SEAT ON AUTOMATIC ROLLERS

Passengers in the rear seat of an automobile can now enjoy the ride without any discomfort caused by the strong wind, by the use of a simple and flexible windshield or screen which has lately been introduced in Paris. The contrivance, which is made of celluloid, has two sections, each of these being housed in a small nickelplated tube that is fastened to the side of the car. When the occupant of the rear seat objects to the wind, he merely reaches over and pulls the two sections of the screen to the center of the machine and hooks them together.



Flexible Windshield for the Rear Seat being Pulled from the Cylinders and Fastened in the Center

When the windshield is no longer desired, it is simply unhooked, and a tension spring automatically rolls it back into the tubes.



Flexible Windshield in Position, Showing How the Rear Seat is Adequately Protected from the Wind

INTERESTING MEMORIALS OF NOTABLE

The First of a Series of Tablets That will be Erected at the Various County Seats of the Eighth Judicial Circuit of Illinois, Which Abraham Lincoln Rode, between 1847 and 1857, While Practicing Law

Monument Built at Bloomington, Illinois, to Celebrate the Centennial of the Arrival of the First White Settler

Drinking Fountain Erected at Kansas City, Missouri, as a Memorial of Lieutenant William T. Fitzsimons, of the U. S. Medical Corps, Who Was the First American Officer Killed in the World War

Finally Adopted Model for the Statue of Theodore Roosevelt to be Erected at Portland, Oregon: The Monument Represents Roosevelt as Colonel of the Rough Riders during the Spanish War. The Statue, Made of Bronze, will Be 13½ Feet High, and 25 Feet Together with the Base

The Actual Horse, Stuffed and Preserved, That was Ridden by General Sheridan during the Civil War: The Horse, Called "Winchester," has Long Stood on Governor's Island, New York, Bearing Sheridan's Own Saddle. It was Recently Moved to the Smithsonian Institution, Washington, District of Columbia, Whither It was Accompanied by Veteran H. W. Valentine, of Brooklyn, Who Was in Charge of "Winchester" during the Civil War

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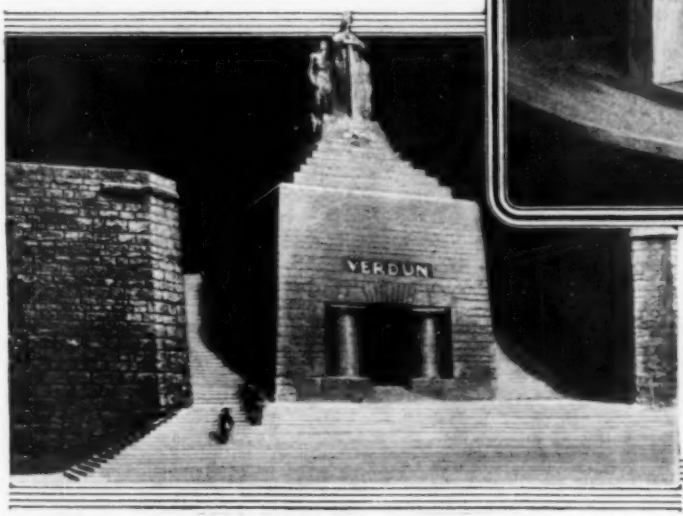
The Monument Shown Below has been Erected at Verdun, the Scene of France's Greatest Effort and Heaviest Sacrifice, during One of the Most Critical Periods of the Great War. The Heroic Defense of the City of Verdun, and Its Surrounding Fortifications, was Stimulated by the Determination That "They shall Not Pass." This Declaration was Not Disproved, For Not One German Reached Verdun—Except as a Prisoner



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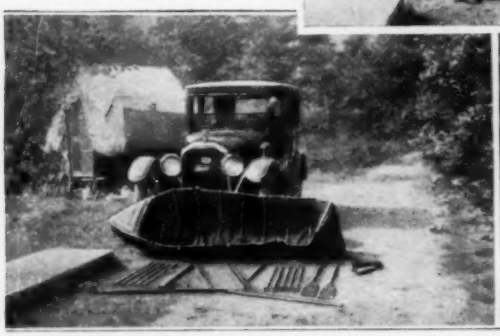
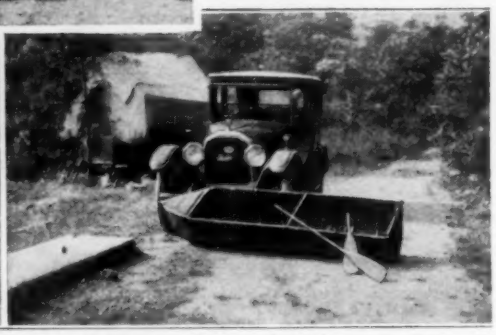
Above Is a Photo of the World-War Service Memorial, with Drinking Fountain, That is to be Erected at Newport Beach, California. The Three Columns beneath the Effigy of "Victory" Symbolize Respectively the Army, the Navy, and the Marine Corps. The Monument will Be of Marble and Bronze

COLLAPSIBLE ROWBOAT MADE TO CARRY THREE

That it can be assembled in three minutes by the merest novice, is one of the features of a new collapsible boat which has a carrying capacity of 500 pounds, or three persons of ordinary size. The frame of the boat is of heavy waterproof canvas which folds in accordion fashion, but when opened to full length, strong strips of ash are inserted into brass clamps along the sides and bottom, forming rigid gunwales and a keel. Latticed floorboards give further rigidity to the craft. The whole outfit weighs only 30 pounds.





Upper Center: Collapsible Rowboat Shown Packed Ready for Carrying on the Running Board of an Automobile. Lower Left: Boat Shown Partly Assembled, with Oars, Latticed Floorboards, and Ash Strips on Ground in Front of It. Lower Right: Boat Entirely Assembled for Use

INGENIOUS RIG FOR HAULING LONG BRIDGE TIMBERS

Because of the sharp curves on the narrow roads in some parts of British Columbia, special methods must be adopted for hauling the long timbers needed in bridge construction. When building a bridge near Williams Lake, timbers 62 feet long were hauled by using a homemade rig fashioned like the ladder truck of a fire department. By fastening the front running gear under the rear end of the timber and connecting the tongue to a capstan above the tim-

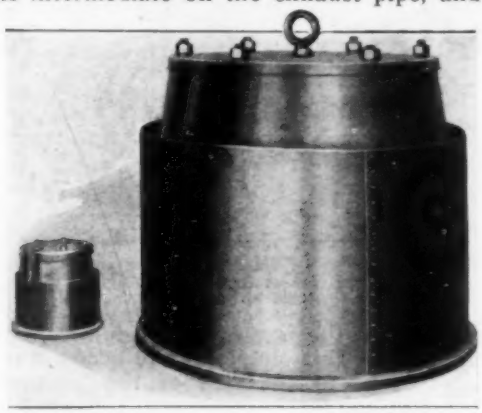
Rig for Hauling Long Bridge Timbers around Sharp Curves: The Man is Operating the Steering Apparatus of the Rear Truck

Full-Length View of the Rig, Showing That It would Be Impossible to Haul Such Long Timbers without the Special Steering Gear at the Rear

ber, it was possible to steer the rear end of the timber and make the trailer follow the wagon that carried the front end of the long timber.

VENTURI-TUBE PRINCIPLE IN EXHAUST MUFFLERS

By making use of the properties of the Venturi tube, a new muffler has been developed that will eliminate the noise of rapidly expanding gases, such as the exhaust of an engine, and as there is no retardation of the flow of the gases, there is also no back pressure, or, at the most, much less than in mufflers of the ordinary straight tubular construction. These silencers are cylindrical and are of two types. One that is used in connection with gas and oil engines is attached to the end of the exhaust pipe. It consists of a series of tapered tubes that alternate with straight tubes so as to give a series of Venturi discharges. The other type is intermediate on the exhaust pipe, and

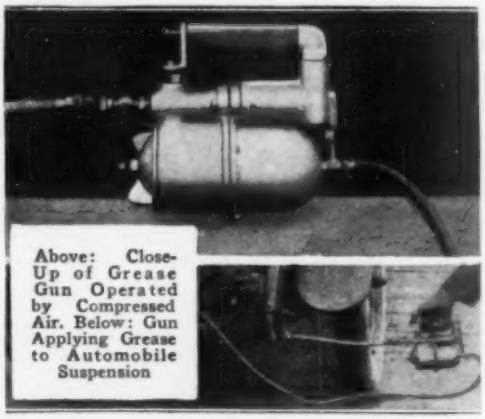


New Type of Muffler That Connects to the End of the Engine Exhaust Pipe: The Small One Is for Three-Inch, the Large One for 12-Inch Pipes

is used on large engine installations on motor ships. Inside its cylindrical housing are a series of cast-iron units attached to the cylinder head, and these are in the form of spirallike passageways, in which at intervals are diverging and converging Venturi throats.

AUTOMOBILE GREASE GUN OPERATED BY AIR

Grease guns are now in favor for forcing grease under pressure into the working parts of automobiles. An improvement of this idea is a new grease gun that is not operated by a hand plunger but takes air from the spare tire, or other source, which forces the grease into the desired part. A flexible hose supplies air to the gun, and a similar hose connects it

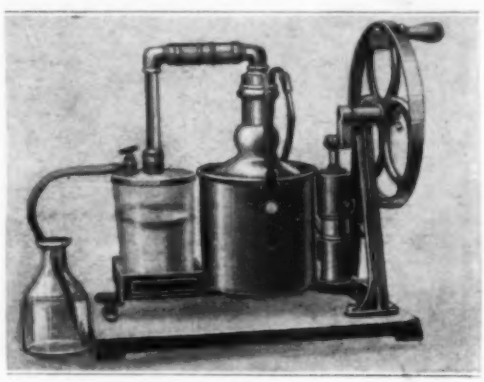


Above: Close-Up of Grease Gun Operated by Compressed Air. Below: Gun Applying Grease to Automobile Suspension

with the part to be lubricated. A trigger, operated by the thumb, serves to control the flow.

HAND-OPERATED ICE MACHINE FOR USE IN THE HOME

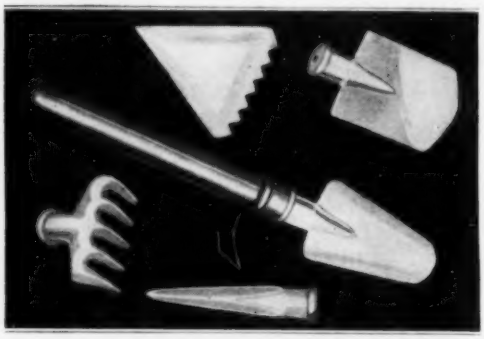
Making ice by hand is a rapid and inexpensive process when a small machine recently introduced in England is used. The action of the machine is based on the principle that water freezes when rapidly evaporated in a vacuum with sulphuric acid to absorb the vapor. The contrivance is especially adapted for icing mineral waters, making ice cream, cooling butter, etc., and if desired, a block of ice weighing 2 pounds can be produced in 20 minutes, thus proving the machine to be a valuable and handy addition in any home when it becomes necessary to provide ice in an emergency.



Hand-Operated Ice Machine Which Is Inexpensive to Use in the Home, Showing the Compact Form of Its Construction

FIVE TOOLS FOR ONE HANDLE OF LIGHT GARDEN SET

Five tools which can be interchanged in one handle compose a garden set now on the market. The tools are constructed



Garden Set Consisting of Five Aluminum Tools Which can be Conveniently Interchanged in One Handle

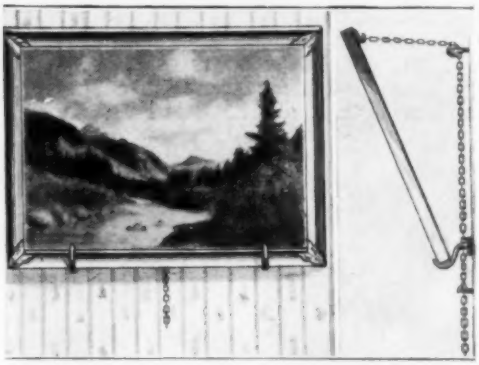
of aluminum, and consist of a trowel, spade, rake, weed scraper, and seed-trench hoe. The handle, made of wood, is only 9 inches in length, and the complete outfit is an efficient and lightweight set, which should be welcomed by anyone engaging in garden work.

REAMER HOLDER TO PRODUCE ACCURATE REAMING

In order to obtain accurately reamed holes, the reamer should be rigid. A holder, adaptable to turret lathes, has been developed that insures the proper centering and alinement of the reamer with the work. This is accomplished by means of hardened and ground machine-steel faceplate adapters that can be attached to the tool holder or the turret of the lathe. The reamer holder and the centering plug are made interchangeable to fit the faceplate adapter, and in this way the work is accurately centered and alined, and afterward reamed.

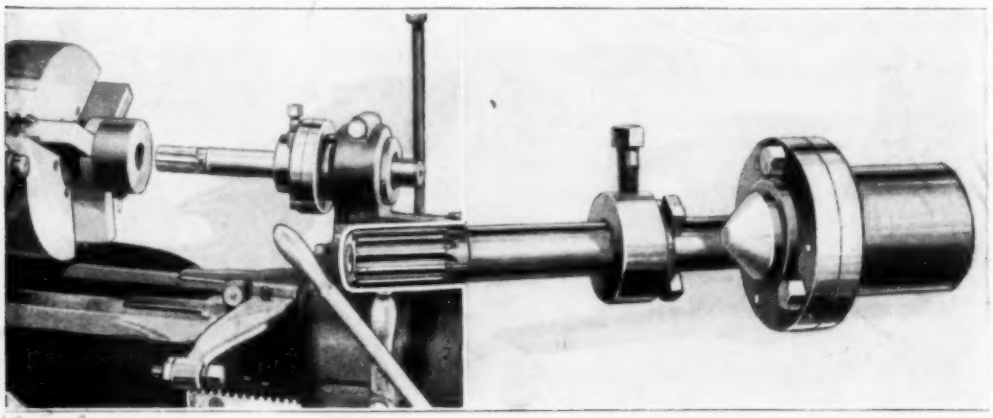
NEW DEVICE FOR HANGING PICTURES AND MIRRORS

An adjustable device, for hanging pictures and mirrors, provides two hooks upon which to rest the lower edge of the frame. A chain, attached to the top of the frame with a hook, passes through a pulley fastened to the wall, down to a hook in the wall, where it is secured. With this arrangement the picture or mirror is adjustable to any angle and



Convenient Device for Hanging Pictures and Mirrors, Which It Holds at the Desired Angle: It Is Adjustable to Suit the Frame

cannot mar the frame, work sideways, or jar down. This simple device accommodates itself to the size of the picture frame or mirror.



Left: Reamer Holder and Reamer as Attached to Turret Lathe, for Producing Accurately Reamed Holes. Right: Reamer-Holder Adapter with Faceplate and Centering Plug; Also Reamer and Reamer-Holding Collar

A Motor Van Equipped with a Cooking Stove Brings Cooked Fish and Potatoes Direct to the Housewife Ready to be Served Hot on the Home Table, While a Counter Provides Service for Transient Trade

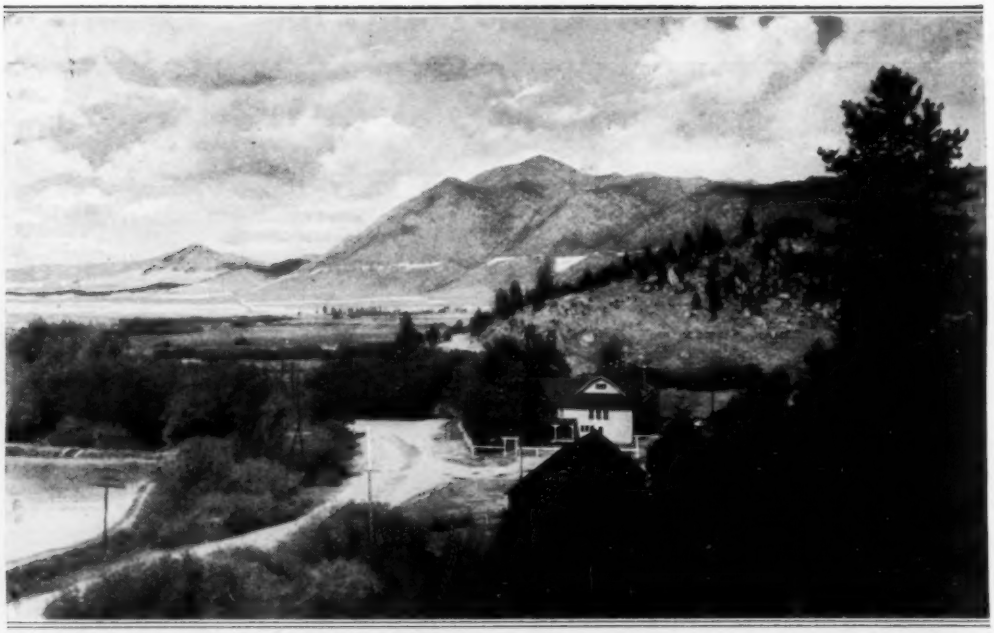
TRUCK BRINGS READY-COOKED MEALS TO HOMES

The tendency of modern times seems to be the reduction of household drudgery to the lowest possible limit, and with this idea in mind, a man living in Leeds, Eng., has fitted up a truck as a traveling kitchen, from which he delivers cooked fish and chipped potatoes to the housewife, ready to be served on the table. The food is cooked in specially fitted pans over a coal fire. The truck also makes the rounds of carnivals or athletic events where large crowds are accustomed to gather, serving the same fare from a counter in the side of the vehicle.

TIERING MACHINE DOES WORK OF NUMEROUS KINDS

Tiering machines, although primarily designed for the purpose of stacking or piling boxes, crates, etc., in warehouses and on docks, can also be used in various other ways. One of these machines, manufactured by a Chicago concern, was recently utilized by a rigging gang in hoisting radiators, motors, line shafts, and heavy pipe to hangers on the ceiling. The appliance is actually a hand-power elevator, having a platform that is raised by the turning of a crank and lowered by gravity, a lifting capacity of 1,500 pounds, and a removable section so that it has a fair range of adjustability for operation with varying ceiling heights.

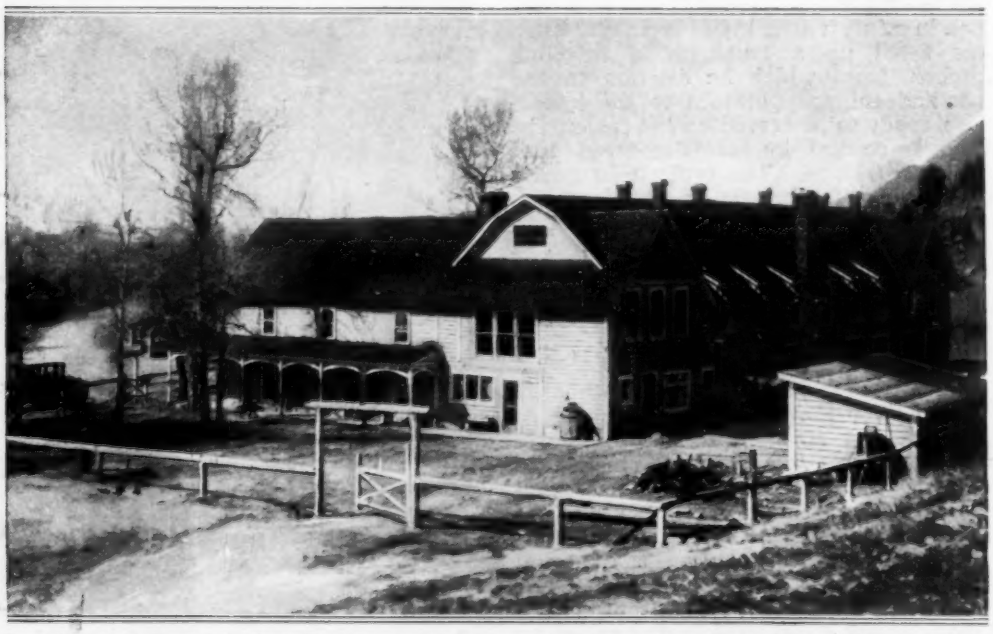
An Unusual Job for the Box-Stacking Machine: It is Here Used by a Gang of Millwrights to Hoist Fittings to the Ceiling of a Shop



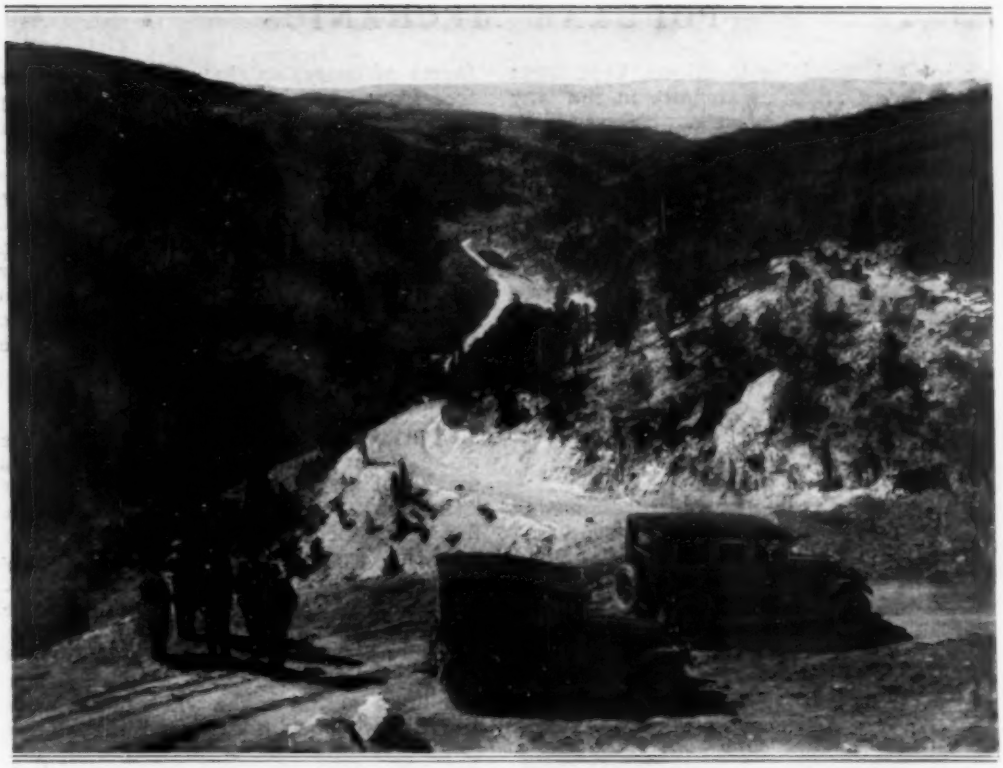
Magnificent View from One of the Heights near the Inn in the Recreational Park, near Butte, Montana: The Inn can be Seen in the Mid-Distance beside the Yellowstone Trail. The Park Has an Area of 3,600 Acres

PLAYGROUND FOR THE PEOPLE IN NATIONAL FOREST

The city of Butte, Mont., has recently been the object of a signal piece of national legislation in acquiring the use of a playground area for its people in the Deer Lodge National Forest, as briefly recorded in the August issue of this magazine. For some time the city authorities had been desirous of using this tract for a park, but as the national-forest lands are open to mineral prospecting, the fear that whatever improvements might be made by them would eventually be hurt



Close-Up of the Inn in the Park That Forms a Playground Area in the Deer Lodge National Forest Set Aside for the Use of the People of the City of Butte: The Inn Is Only About Nine Miles from the City



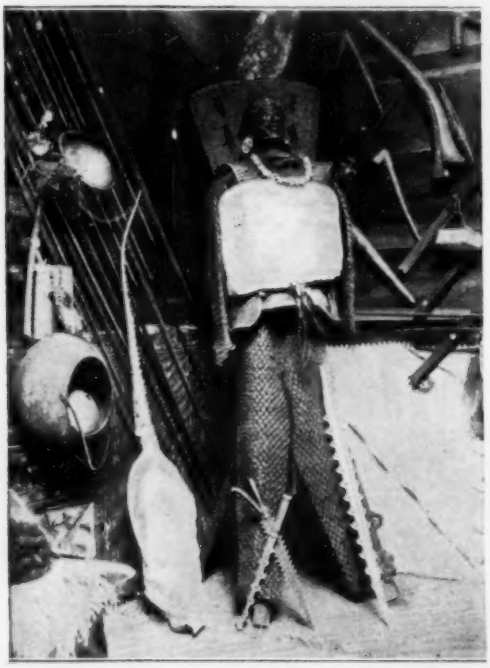
The Park Reserved for Recreational Development Viewed from Lookout Point, and Showing a Short Stretch of the Yellowstone Trail: This Part of the Trail has been Given the Name of "Harding Way"

Another Part of the National Forest That has been Set Aside by the Secretary of Agriculture, by Authority of Congress, for Recreational Development: It Is on the Yellowstone Trail. At This Part of the Park Are Many Ideal Sites for Summer Homes

or spoiled by claim locations, kept them from doing anything definite in the way of establishing the park. So, recently, Congress passed a bill which empowered the secretary of agriculture to set aside for the recreational development of Butte the tract which is located nine miles from Butte on the Yellowstone Trail. The only purpose of the bill was to prevent prospectors from entering the segregated portion and taking up land there under the mining laws. The Forest Service is given absolute control over all forms of entry, so that the lands are as free from unauthorized use as if the city owned them in fee simple. One of the purposes of this service is that of encouraging all legitimate uses of the national forests, and it is felt that the legislation in favor of the development of the recreational life of Butte, will do more to help in that respect than any other that has been passed since the forest was created. The tract made available to the city is about 3,600 acres in extent, in Nine Mile Cañon.

CURIOUS ARMORED SUITS OF GILBERT ISLANDERS

Perhaps the strangest and rarest armor in the world is that once used by the Gil-



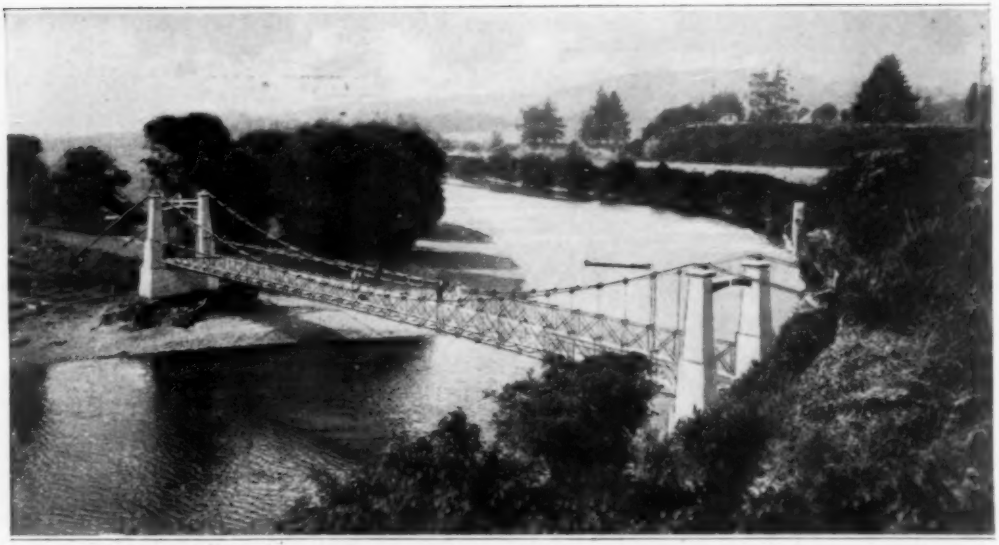
Suit of Armor, Made from Fish Skin and Woven Coconut Hair, Once Worn by a Chief of the Gilbert Islands

bert Islanders in the South Seas, the only branch of the Polynesian people who ever reached the height of producing a coat of mail. The armor, of which only a few examples remain today, consists of an undergarment covering the legs, body, and back of the head, and a breastplate. The under part is woven from the coarse hairy cover of the coconut. The skin of the ray fish, which dries almost as hard as steel, but is very light, is made into a breastplate. This armor will turn any spear, sword, or knife of native make. But more interesting than its making is its former use, proving that knights who did chivalrous battle were not found in Europe alone. So difficult was the armor's manufacture that only one suit was owned by each Gilbert Island village. Thus, when trouble arose between two villages, the best man from each donned his armor suit and went out and settled the matter by single combat. The introduction of the white man's ways and his weapons has caused the almost total disappearance from native ownership of these strange but skillfully made suits, most of them having been carried away by collectors.

CONVENIENT T-SQUARE GUIDE FOR DRAFTSMEN

Draftsmen often find it necessary to work on a drawing that is beyond the reach of their T-square, or on a long drawing that has to be rolled. In such instances a straightedge guide, readily attached to the board or table top with thumbtacks, will serve the purpose of holding the head of the T-square in alinement as, in the ordinary manner of working, the edge of the board does.

Draftsman Working on a Rolled Drawing and Using a T-Square Guide, Attached to the Board by Thumbtacks



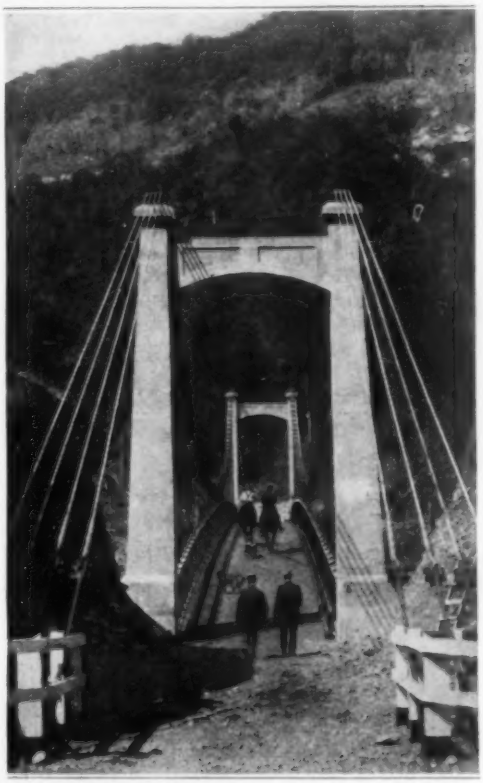
Suspension Bridge over the Hutt River at Maori Bank, New Zealand: It is Built Almost Entirely of Reinforced Concrete. On the River, in the Distance, is Seen an Old Native Canoe Which was Used for Bringing the Gravel for Making the Concrete down the River

SMALL SUSPENSION BRIDGES BUILT IN NEW ZEALAND

Several small suspension bridges of an improved type have recently been built in New Zealand. One of the best of them is over the upper Hutt River, at Maori Bank. It has a span of 170 feet, and is 12 feet wide. The towers are 25 feet high, and are of reinforced concrete on heavy foundations. The bridge span is suspended by 62 rods of ⅞-inch iron, attached 5 feet apart by reinforced-concrete clips to eight suspension cables which pass over the tops of the towers on rollers and are anchored in concrete to a depth of 35 feet. The bridge deck is of reinforced concrete supported by the longitudinal girders, constructed with chords made of 1⅝-inch pipe trussed with angle irons. The total load on the cables is 60 tons.

HEIGHT LIMIT OF BUILDINGS INCREASED IN LONDON

The height limit of buildings in London, Eng., has been raised 20 feet, which nevertheless restricts them to the very limited height, according to American standards, of 80 feet from the pavement to the ceiling of the top story. This decision, recently made by the London county council, was accompanied by a regulation increasing the allowable floor area of any single compartment to 40,000 square feet, which will necessitate wall spans that will add considerably to the use of steel girders in their floor construction.



Another View of the Bridge: The Towers Are 25 Feet High, the Bridge Deck Is of Reinforced Concrete and 12 Feet Wide

AMERICAN AUTO MAKES ATTRACTIVE HANSOM CAB

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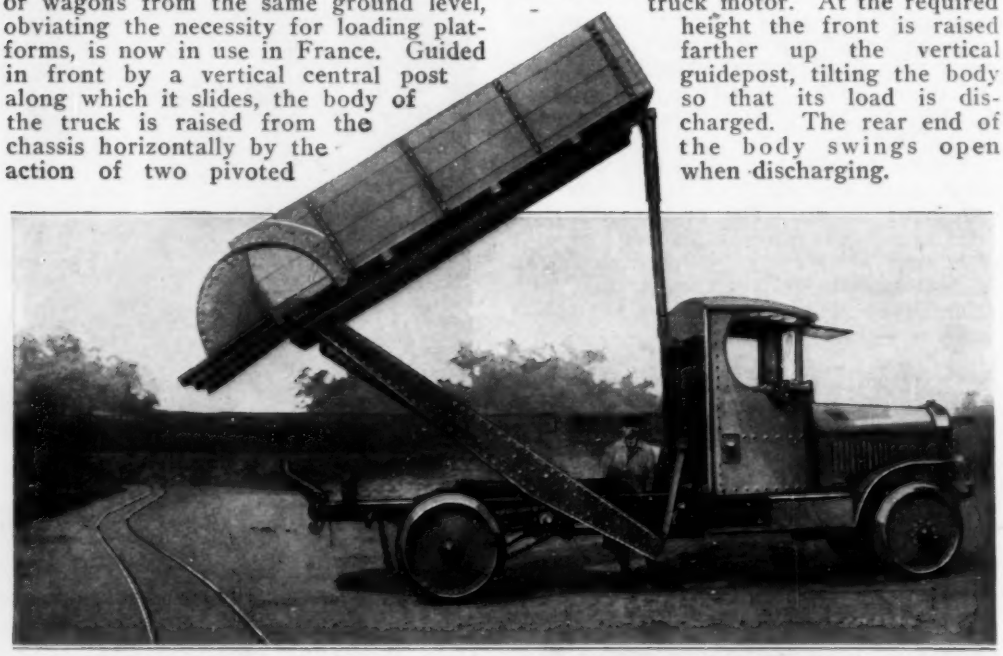
Here is Pictured the Hansom Cab of Today, Built on a Light American Automobile Chassis. The Only Missing Parts Are the Shafts and Horse. The Driver's Seat Being in the Rear, the Passenger Enjoys an Unobstructed View and a Feeling of Greater Privacy

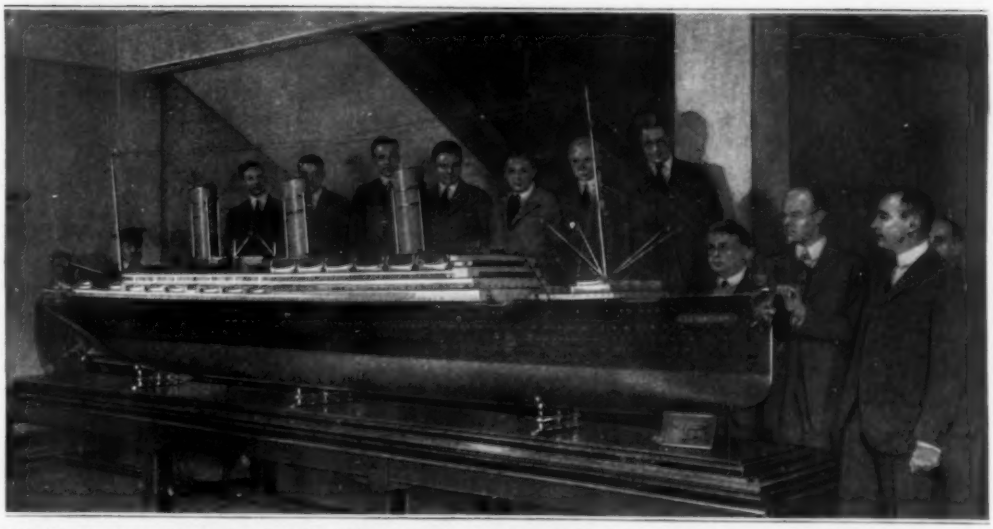
The introduction of the automobile with its conventionalized lines, has witnessed the passing of the picturesque horse-drawn vehicles of a generation ago. A revival of one of these has recently been seen on the boulevards of Paris, in the appearance of a modern adaptation of the once familiar hansom cab. The version of today shows the driver with his hands on the steering wheel instead of on the reins, and wearing a chauffeur's cap in place of the dignified "stovepipe." Our "cabby" does not worry about oats to fill the feed bag, nor about blanketing his horse.

TRUCK WITH ELEVATING BODY FOR DUMPING

A motor truck with an elevating body for dumping directly into railroad cars, or wagons from the same ground level, obviating the necessity for loading platforms, is now in use in France. Guided in front by a vertical central post along which it slides, the body of the truck is raised from the chassis horizontally by the action of two pivoted lever arms connected to the rear of the body, and which are operated by the truck motor. At the required height the front is raised farther up the vertical guidepost, tilting the body so that its load is discharged. The rear end of the body swings open when discharging.



Truck with Dumping Body for Loading Cars or Wagons at the Same Ground Level: The Truck Body is Shown in Its Discharging Position after having been Raised by the Action of the Pivoted Lever Arms at the Rear, and the Vertical Post in Front of the Body



This Model of the "Leviathan," Built before the War by Expert Workmen Sent Over from Germany, was Held by the Alien-Property Custodian until Just Recently, When It was Turned Over to the United States Shipping Board and Now Stands in Its Offices at Washington

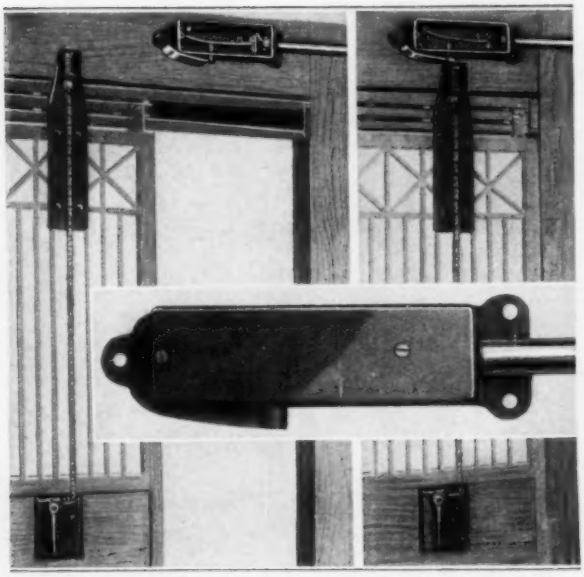
MODEL OF "LEVIATHAN" PASSES TO SHIPPING BOARD

At the time when the "Leviathan," then the "Vaterland," belonged to the Hamburg-American line, expert workmen were sent over from Germany to build a model of the famous ship. The model, 18 feet 6 inches long, 1 foot 11½ inches beam, and 1 foot 5½ inches in depth, was held by the alien-property custodian during the war, but has now been turned over to the United States Shipping Board and stands in the main hall of its offices at Washington. The model cost $25,000 to build.

USE AIR DRILLS AND WEDGES TO BREAK UP CONCRETE

The difficulty of breaking up well-set concrete structures was forcibly illustrated at Second Avenue and 14th Street, New York City, when the work on the new subway along this street required a rearrangement of water mains, and electric and gas conduits. At Second Avenue two huge reinforced-concrete anchors were built for the hoisting and lowering cables used in this heavy work. Each of these artificial-stone bowlders was 15 feet long, 7½ feet tall, and 5 feet wide. As the two anchors were built on the outer edge of the sidewalk, their removal was begun immediately after the rearrangement work was finished. No blasting being allowed, the air drill was the only means of breaking up the concrete anchors, so two drillers were put to work on each anchor, while two other men used the sledge and wedge for breaking off the drilled sections. While each anchor was built in a little over a day, it took almost two weeks to break up and remove each of them.

Above is Shown Men at Work with Air Drills, Making Holes in a Large Concrete Anchorage, Preparatory to Breaking It Up with Wedge and Sledge Hammer

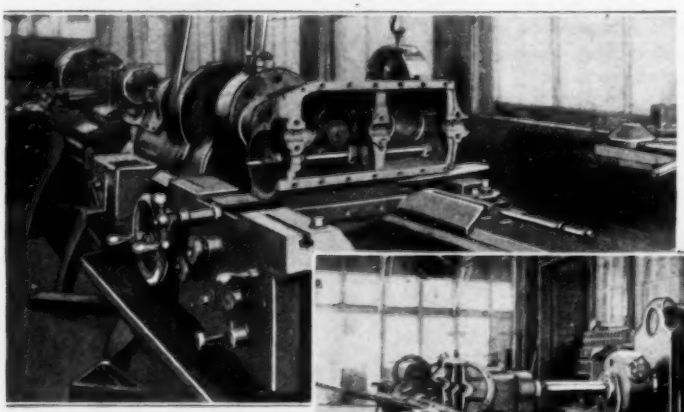


Interlocking Safety Device Shown at Left with Elevator Door Partly Open, and at Right with Elevator Door Closed and Locked. Inset: Dustproof Bakelite Switch Box Shown with Cover On

INTERLOCKING DEVICE FOR ELEVATOR DOORS

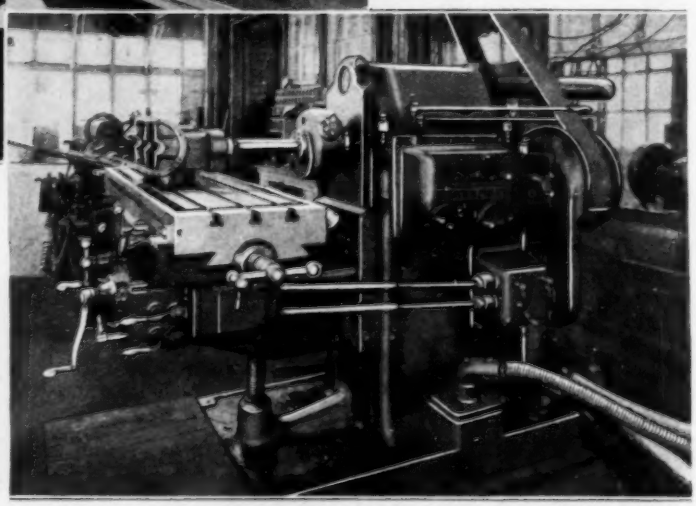
One constant danger of accident in connection with elevators in buildings can be eliminated by the use of an attachment that makes it impossible to start or operate the elevator when any of the shaft doors are open. Above each of the elevator doors is a dustproof electric-switch box which has a contact that operates in connection with a contact-making unit on the sliding door of the elevator, so that whenever any door is open, there is no contact at that point. This opens the elevator-control circuit, and the car cannot be moved until all the doors are closed, thus bringing the contacts into position for closing the circuit. An emergency switch is provided, so that the interlocks can be cut out in case of fire.

CYLINDER GRINDER FOR LATHES AND MILLERS

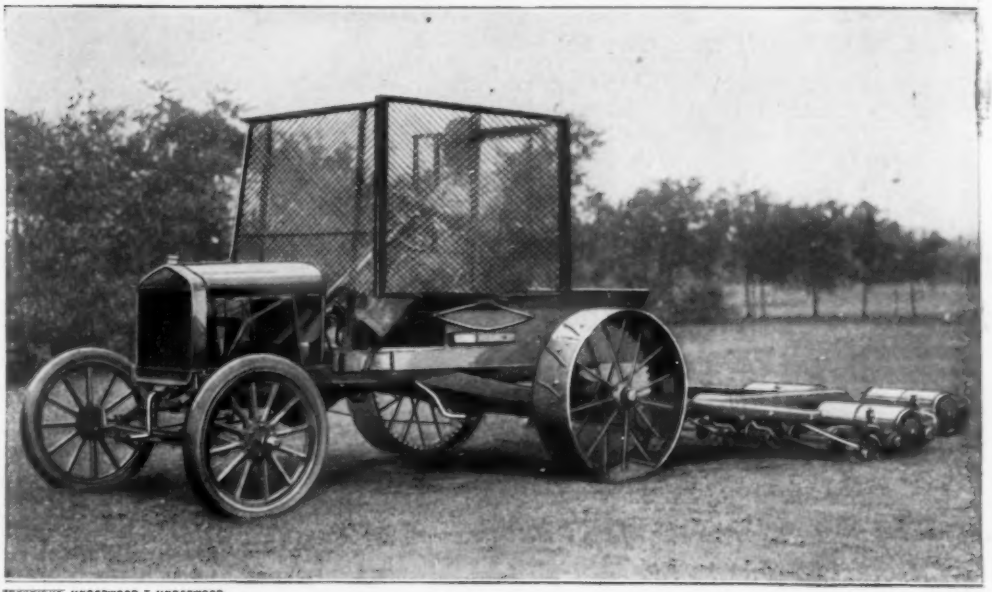


Above: Cylinder Block Shown Fastened to the Carriage of a Lathe, and being Ground

A cylinder-grinding attachment for either lathes or milling machines, produced in New Orleans, makes a special machine for this purpose unnecessary, and should therefore be of advantage to small service stations. The grinding head is mounted on the driving spindle of the lathe or milling machine, and the cylinder block is centered and then fastened to the carriage of the lathe or the table of the milling machine. In the head is gearing for running the grinder at various speeds, and a special centering jig is provided.



Cylinder-Grinding Device Operating in Connection with a Milling Machine: The Cylinder Block is Fastened to the Table, and the Grinding Head is Mounted on the Driving Spindle



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The Wire Cage was Mounted on This Machine After the Driver had been Seriously Injured by a Stray Golf Ball. Two Horses were Killed on the Same Course before the Installation of the Motor-Driven Lawn Mower

SHIELD LAWN-MOWER DRIVER FROM STRAY GOLF BALLS

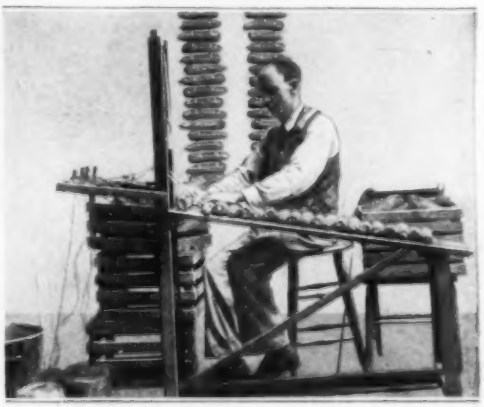
Is the operator of a mowing machine on a golf course likely to meet with death? Authorities of the Lincoln Park golf course in Chicago answer in the affirmative. After two horses had been killed by misdirected golf balls, a small automobile was adapted to draw the lawn mower. The problem seemed solved. But the second day the driver sustained a blow on the head that resulted in a trip to the hospital. Now the driver is inclosed in a wire cage.

NEW FORM OF DOUBLE RUDDER BEING TESTED IN GERMANY

There is being fitted to an 8,000-ton motor ship now under construction at Hamburg, Germany, a new form of rudder, which has already been used with marked success, it is said, on comparatively small-sized vessels. Hinged to the rear end of the main rudder, which operates in the usual way, is an auxiliary rudder. To turn the ship to port, this auxiliary rudder is moved to starboard with the result that the water pressure on this auxiliary portion of the rudder moves the main portion to port. It is claimed that this greatly reduces the power required to move and hold the rudder, and that, consequently, smaller steering engines can be used.

DEVICE FOR STRINGING CORN IS SIMPLE AND RAPID

For rapidly stringing ears of corn so that they may be hung up for drying and for storage, a device has been invented that consists of inclined frames, over one of which the stringing cords are drawn tight, while on the other the operator weaves the cords successively around the ears. Horizontal guide bars, operated by the up-and-down movement of a treadle, cross the cords alternately over the ears, and weave them together without bruising them. The treadle operates against the tension of a coiled spring above it.



Device for Rapidly Stringing Ears of Corn So That They may be Hung Up for Drying or Storage, as Seen behind the Operator

REVERSIBLE FLANGE FEATURE OF NEW MANHOLE COVER

In a new manhole cover, being adopted by the city of Chicago, the flange supporting the cover is made separate and reversible. When the flange of the ordinary manhole wears out, the street must be ripped open and the entire support replaced. With the new cover, the base is permanent, and requires no attention after being firmly imbedded in the concrete foundation of the pavement. Resting on the base is the inner curb, which has a flange to hold the lid. When the flange becomes worn, the curb is taken out and reversed.

RUGGED ELECTRICAL HEATER HAS MANY APPLICATIONS

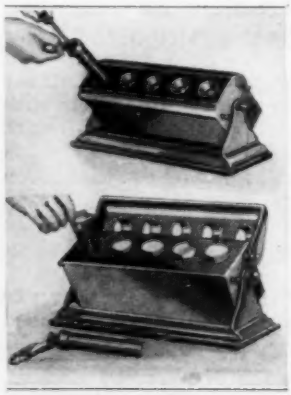
Its ruggedness of construction and easy adaptation to many heating possibilities, are the features of an electrical appliance recently introduced by an eastern manufacturer. The heater, which is made in various sizes, wattages, and voltages, has a sheet-steel outer casing containing holes for mounting purposes, while both of the terminals are on one side, leaving the other side flat. Uses to which the contrivance can be put are the heating of presses, rolls, ovens, rooms, booths, water tanks, and garages; the ripening of fruit; and protection of windows from frost, and drying of clothes in winter.

TRACTION DYNAMOMETER GIVES NEW SOIL-TILLAGE DATA

An amplification of the traction-dynamometer idea for measuring the soil resistance to tillage implements, records as well the distance, time, speed of travel, magnitude of pull, and average depth of cut. Oil in a cylinder is put under pressure, by a piston, varying with the tractor pull, the variations being recorded on a roll of paper. The drum carrying the paper is driven at a speed proportional to the rate of travel through a flexible shaft from a trailing wheel.

SIMPLE DEVICE TO MAKE POPULAR CONFECTION

Chocolate-coated, ice-cream-filled confections in various forms have become increasingly popular within the past year. An interesting development of this idea is one recently advanced for putting them up in small cylinders that conveniently fit the hand. An added feature is that the confection can be easily and quickly made fresh, as required, with a little machine for holding the shells, and a squirt gun for filling them.



NEW CONTAINER IS A BOON TO CHEMICAL INDUSTRY

Manufacturers and users of corrosive chemicals have long been handicapped in the matter of transport and storage. A patented container, now being put on the market, will enable them to realize the economy in first cost, handling and freight charges, and depreciation, as well as the safety and convenience that dealers of less active products have enjoyed. It consists of a flexible rubber cylinder suitably suspended in a wooden barrel.

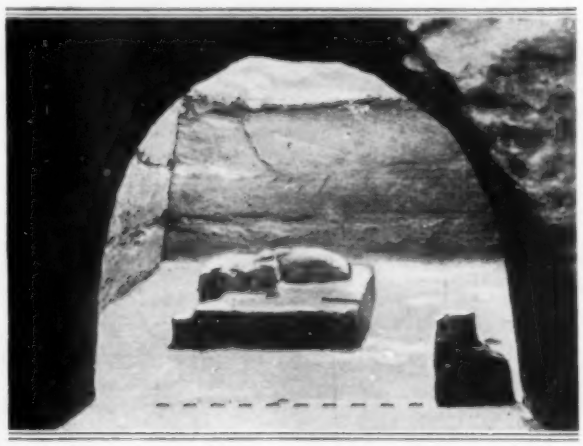
The Cemetery of El Kur, on the Right Bank of the Nile, in the Sudan, Showing Several of the Tombs Uncovered by the Excavation, Which Revealed the History of 26 Generations of Ethiopian Kings, and the Arts of a Lost Civilization

WORK OF THE ARCHÆOLOGICAL EXPLORER

By F. N. HOLLINGSWORTH

PEOPLE often wonder how the explorers of ancient ruins in Egypt, Palestine, Mexico, and elsewhere make their discoveries; how they know where to look for what they find, and how they know that anything may be found where they search.

The work of the Harvard University-Boston Museum of Fine Arts expedition to Ethiopia, which has spent 10 years in Egyptian archæological exploration and is still working there, is an interesting example of how such explorations are carried out. Its search has resulted in the discovery, in an obscure village beyond the borders of Egypt, on the banks of the Nile River, of a great number of tombs which were found to contain the history of 26 generations of Ethiopian kings who ruled over Egypt, and the recovery from beneath the deeply drifted sands of material buried and lost to human knowledge for thousands of years, revealing the arts and crafts of this lost civilization. The discoveries were made at Napata, the capital of Ethiopia.



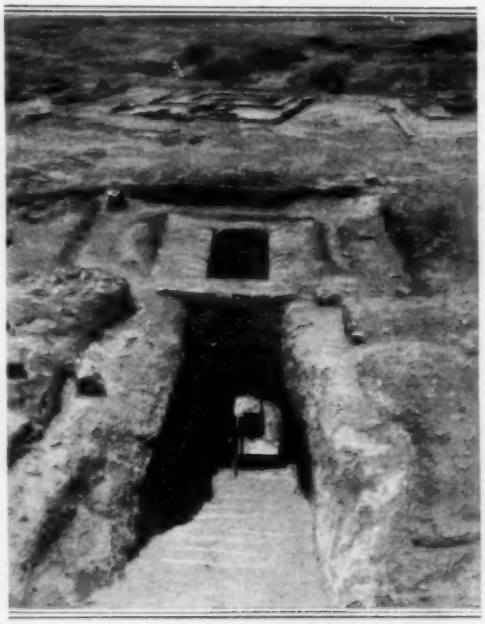
A View of the Burial Chamber of King Shebitku, with the Broken Coffin Bench Showing in the Foreground

Archæological exploration work requires engineering and architectural knowledge, along with many other things, such as knowledge of ancient languages, hieroglyphics, ancient history, and the arts and crafts. The ex-

plorer comes upon a mound, or series of mounds, of drifted sand in the desert in a region known to have been inhabited by ancient races. He sets his trained workmen to clearing away the sand, after first having made photographs of the undisturbed site. As soon as a tomb or pyramid is uncovered, the stairway leading into the tomb is the first to be cleared. This had been filled in after the funeral with the clean débris left after the excavation of the rock-cut chambers and the building of the pyramid. Then the plunderers came, at some time or other, and dug a hole in the clean filling of each stairway, this hole afterward becoming stopped up partly with the things that the grave robbers threw away as valueless, and partly with drift sand. The robbers were naturally after the gold and jewels they knew had been buried in the royal tombs.

Necklaces of Garnet, Carnelian, Wrought Gold Beads, and Amulets, Taken from the Early Tombs of the Ethiopians

It is easy to distinguish between the original filling and the débris of the thieves' tunnel. The objects found in the latter usually came from the royal burial chamber and, in the records of expeditions, have to be carefully distinguished from other objects. When the doorway at the foot of the stairs has been reached, the workmen begin to clear the pyramid above, or another stairway, until the record of the blocking and measurements of the stairs have been made. After that, the sand is removed, leaving only about 8 inches of the floor débris intact. Whatever is found in the sand—and it is usually little enough—is considered as having washed in from the thieves' tunnel outside. When the sand is out, then the serious and difficult work of examining the floor débris and removing it bit by bit begins, and for this only the most skilled Egyptian workers are employed, under the supervision of a member of the expedition. This floor dirt is to the Egyptologist what pay dirt is to the gold miner.



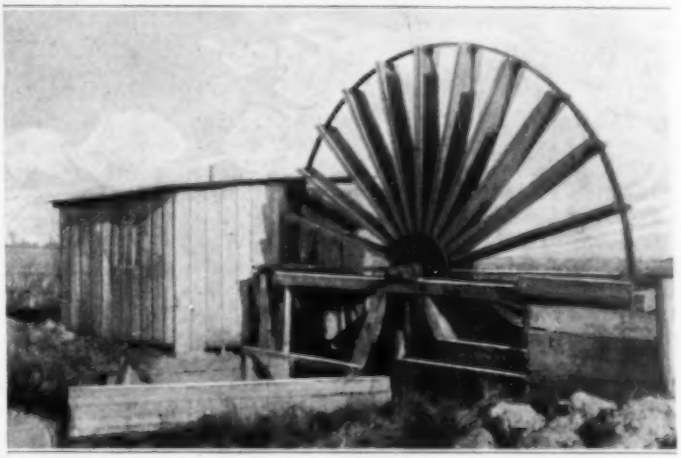
The Vaulted Burial Chamber of King Pankhi, with Stairway Seen Leading Downward

Detail photographs are made of the excavation as it progresses, both inside and outside of tombs and pyramids. Then the important objects which are found within are photographed, usually with a scale beside them, so that their actual size is shown. In the case of the Ethiopian expedition here referred to, some of the finds were unique. Outside of the importance of the discovery of a hitherto lost period of ancient history, this expedition obtained a magnificent collection of specimens of the work of the royal craftsmen—of the goldsmiths, the coppersmiths, ivory carvers, makers of stone vessels, the faïence workers, and the amulet cutters. In other words, the expedition established a practical monopoly of the royal works of Ethiopia, which have been brought to America and deposited in the Boston Museum of Fine Arts for the study and benefit of American craftsmen and designers. So small are many of the objects found in these ancient ruins, such as beads and amulets, that they would be lost or broken if picked up with

an ordinary shovel and turned over with the dirt. The work is done by hand, the débris being picked over and examined bit by bit. This care resulted in the finding of several strings of beads and necklaces of gold, garnets, faience, and semiprecious stones, which were later put together in matched order and photographed. Another discovery was a horse cemetery — the first ever found in the Nile Valley. The graves were in four rows, and contained the horses of some of the famous Ethiopian kings. All had been plundered, but enough remained to show that each horse was buried upright with its head toward the south. The trappings found included a plume carrier of gilded silver strings and bronze balls.

NOVEL WHEEL PUMP FOR DRAINING MARSHLAND

But for a novel kind of wheel pump, designed by its owner, a now fertile farm of 196 acres bordering on Lake Erie, six miles west of Sandusky, Ohio, would still be mostly an untillable area of marshland, as it was only six years ago. The wheel, 16 feet in diameter, has a number of radial paddles, 14 inches wide, connected to a gear forming the wheel rim. Geared to this is a 9-horsepower gasoline engine that drives it. The wheel is mounted over a water pit, into which tile drains lead from all parts of the marshland. As the water collects in the pit it is lifted by the paddle wheel to a flume above, which carries the water into the lake. Whereas, before the use of this drainage system, only a small part of the farm could be cropped, last year the farm produced 5,000 bushels of shelled corn, and wheat yielded an average of 35 bushels an acre.



Wheel Pump That Drains 116 Acres of Marshland on a Farm Six Miles West of Sandusky, Ohio: The Wheel Is 16 Feet in Diameter

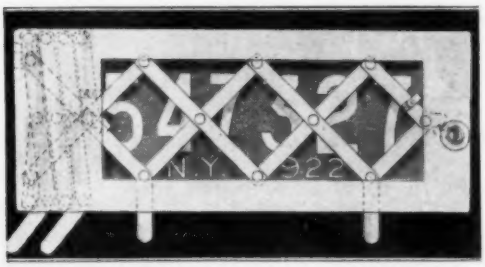
BRICK CHURCH BUILT AROUND FRAME STRUCTURE

Building their big new brick church around the little old frame structure that had served so long as a house of worship, was an idea conceived by the deacons of a colored congregation in Lexington, Ky. The reason for this odd procedure was the pardonable unwillingness of the zealous brethren in charge, to run the risk of losing any of the fickle members to a rival church during the construction period. Consequently, the imposing brick edifice was reared over the unpretentious wooden shack, the latter not being torn down until its presence hindered progress on the new building.

The New Brick Church of a Negro Congregation in Lexington, Kentucky, under Construction around the Old Wooden House of Worship

AUTO-THIEF SIGNAL OBSCURES LICENSE WITH RED BARS

A series of red bars which partly conceal the license plate and so draw atten-



The Illustration Above Shows the Bars as They Appear When Extended and Locked. The Dotted Lines Show How the Bars Fold When Not in Use

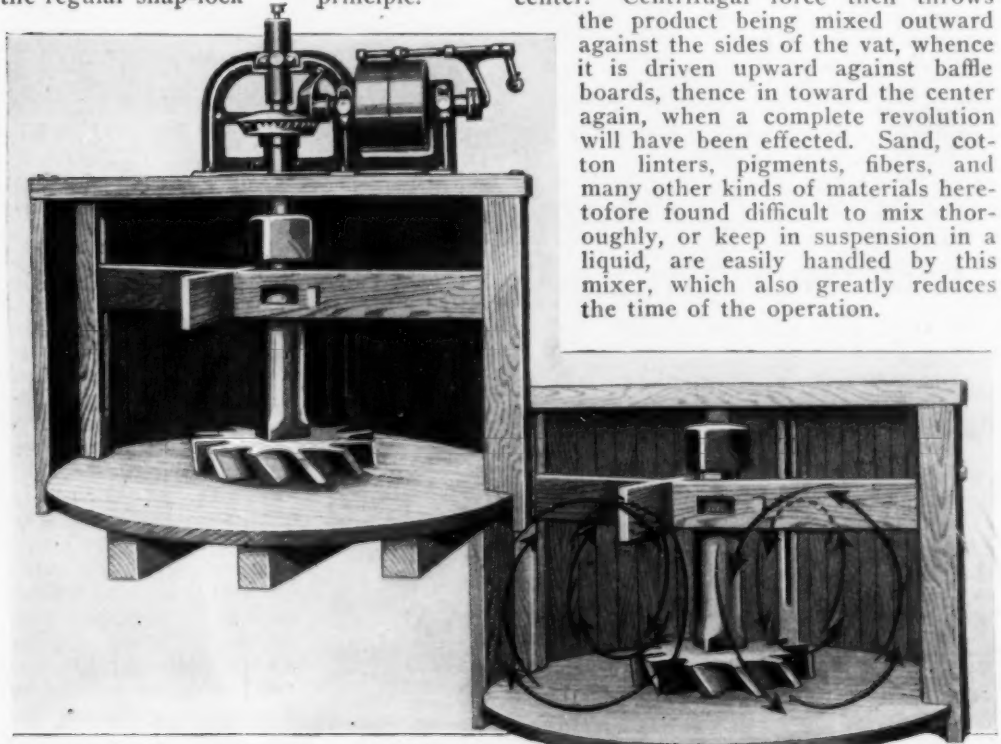
tion to the fact that the car is illegally operated, is the feature of a new auto-theft device. The bars are manipulated on the principle of lazy tongs and are held by a bracket which forms a rim for the license plate. When the owner parks his car, the bars are extended and locked. Each bracket is equipped with an individual lock and key. The lock works on the regular snap-lock principle.

TRANSFORMERS OF NEW TYPE FOR DIRECT CURRENT

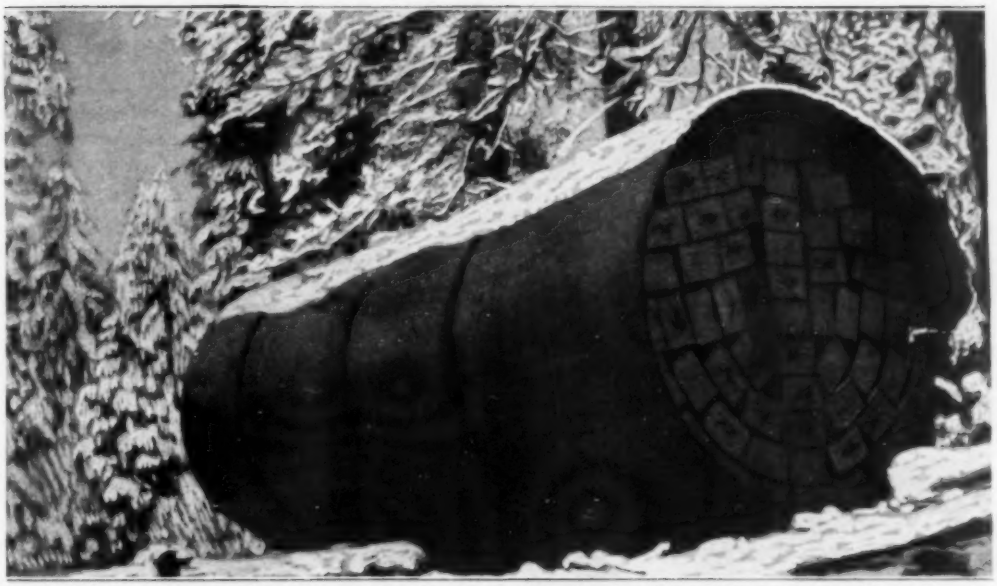
Transformers, or "transverters," as they have been termed and which are to be used for converting alternating into direct current, are now undergoing extensive tests in London, Eng., preparatory to being installed for traction service in that city. These machines have successfully built up 100,000 volts for transmission lines, during experiments, and it is proposed to place similar apparatus along the lines at desired points, for the reduction of this high pressure to suitable working voltages.

MIXER STIRS TANK CONTENTS WITH VERTICAL MOTION

Stirring the contents of vats, tanks, etc., with a vertical instead of the usual horizontal swirling motion, is possible by the use of a turbine mixer having a special multiblade rotor. The rotor extends to the bottom of the tank and its blades are placed at a 45-degree angle so that, in motion, they tend to draw the liquid, or semiliquid, contents downward at the center. Centrifugal force then throws the product being mixed outward against the sides of the vat, whence it is driven upward against baffle boards, thence in toward the center again, when a complete revolution will have been effected. Sand, cotton linters, pigments, fibers, and many other kinds of materials heretofore found difficult to mix thoroughly, or keep in suspension in a liquid, are easily handled by this mixer, which also greatly reduces the time of the operation.



Two Internal Views of New Mixer, in Which the Angular Disposition of the Rotor Vanes Causes the Contents to be Stirred Vertically, as Indicated at the Right: The Baffle Boards Float on Top of the Liquid and Stop Any Tendency of It to Swirl Horizontally



Penstock Pipe, 14 Feet in Diameter and 32 Feet Long, being Used as Storage for a Carload of Powder: The Pipe was Used in This Manner at the Railroad-Delivery Point of Materials and Supplies, Which Later were Hauled a Distance of 34 Miles over the Mountainous Country

PENSTOCK PIPES UTILIZED FOR STORAGE PURPOSES

During the construction of a large power plant in one of the northern counties of California it was necessary to haul material and supplies by team over the mountainous country for a distance of 34 miles from the railroad to the power-plant site. Half the distance was at such an elevation that, in the winter, there was always plenty of snow to make good sleighing, while below the snow line there was a fairly good roadway. Among the material to be hauled were 90 pieces of penstock pipe, each 14 feet in diameter and 32 feet long. A bobsleigh was placed under the front end of the pipe, and the rear end rested on a wide steel shoe, shaped like a runner. At the snow line these pipes were loaded onto motor trucks. While awaiting transportation at the railroad station, as there was no other accommodation, these huge pipes were used as storehouses for groceries, explosives, and other merchandise easily damaged by the weather.

MONUMENT RECORDS ORIGIN OF POLAND-CHINA HOG

The first monument ever erected to record the origination of a breed of stock was recently unveiled on a farm a mile north of the little village of Blue Bell, Warren County, Ohio, to commemorate the birth, in 1850, of a strictly American breed of hog—a Poland-China. An opening was left in the foundation for a copper box containing a duplicate of the first pedigree, a volume of the first pedigrees printed, and other valuable articles. It will be sealed later.

Monument Erected in Ohio to Commemorate the Origin of the First Strictly American Breed of Hog

¶Whenever you find that you wish to know more about any article in the magazine, write our Bureau of Information.

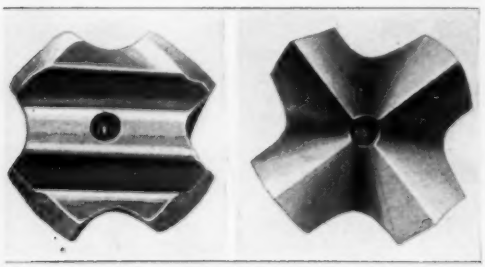
PORTABLE RADIO EQUIPMENT SET UP IN FEW MINUTES

Portable radio sets for boy scouts, campers, motorists, yachtsmen, or vacationists in general, and which are contained in a 6 by 6 by 3-inch box, weighing 3½ pounds, are now available. The outfit consists of a crystal-detector set having a range of 25 to 30 miles, which can be tuned to wave lengths of 100 to 600 meters; 90 feet of antenna wire; two insulators; 10 feet of ground wire; one ground spike, and a headpiece, all of which may be set up, ready for receiving, in 15 minutes.

Portable Radio Outfit Opened, with Headpiece, Antenna, and Ground Wire Packed in the Cover, Ready to be Taken Out and Used

DETACHABLE ROCK-DRILL BIT INDICATES ECONOMY

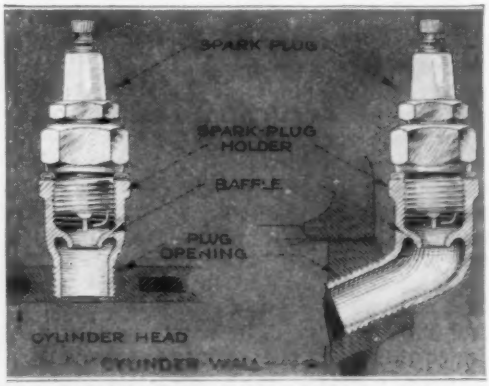
A radical departure in rock-drill practice is the adoption, by a western mining company, of a detachable drill bit. The bit and drill rod are fitted together with an accurately machined tongue and groove, which, being inserted on a taper, tighten with each succeeding stroke of the drill. A few blows from a hammer suffice to loosen the bit. This reduces the expense of handling the drill rods to and from the work for sharpening, and permits the use of the highest-grade steel in the bits, giving greater drilling speed. The bits can be reground, without retempering, to the next smaller size a number of times, thus eliminating another item of expense.



Right: Cutting Face of Detachable Rock-Drill Bit. Left: Showing Tongue on End of Bit, Which Attaches It to Drill Rod

NEW SPARK-PLUG HOLDER PREVENTS FOULING

Some automobile engines pump oil into the combustion space. If the spark plugs are located in the cylinder wall so as to catch this oil, excessive fouling occurs. The result is irregular firing and unsatisfactory operation. A man exasperated with this trouble, has devised a holder which screws into the cylinder in place of the spark plug. The holder carries the spark plug in such a position that the oil does not reach the points, and fouling is prevented. An added advantage claimed for this device, is a perceptible increase in power. The holder does not become sufficiently heated to cause preignition, because the cylinder is water-jacketed at that point.



Left: Nonfouling Spark Plug Attached to Cylinder Head of Gasoline Engine. Right: Similar Plug Shown Attached to Cylinder Wall

¶A French scientific magazine reports that a method of utilizing earth currents of electricity has been found. No description of the apparatus is given, but it is inferred that ordinary electric lamps can be lighted by earth currents, and that when a special static transformer is available, distribution will be possible.

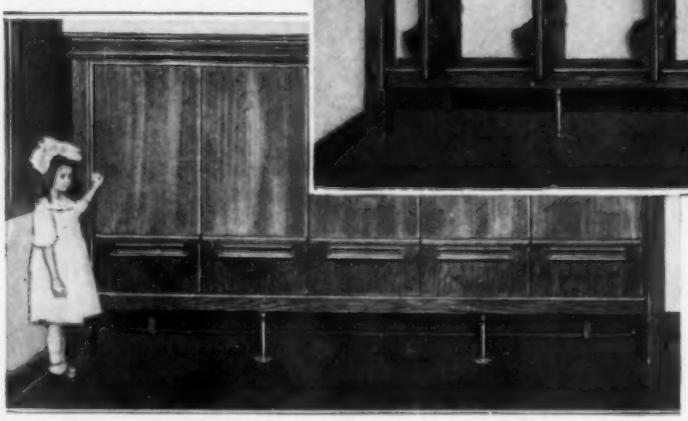
MOISTURE TESTS MADE ON CONCRETE ROAD PAVING

ALONG either side of a test highway at Pittsburg, Calif., ditches were dug in such a manner that they could be filled with water to the level of the top of the subgrade. Through holes provided in the concrete paving, borings were taken of the subgrade, before the water was turned into the ditches and afterward, to determine the variations in its moisture content. In tunnels constructed under the paving, observations were made of the effect of different degrees of moisture on the carrying power of the paving under traffic conditions.

SCHOOL WARDROBE CHANGES INTO BLACKBOARD

Wardrobe and blackboard are combined in a new piece of school furniture that seems both practical and convenient, especially for smaller rural schools. The wardrobe consists of five individual compartments with swinging doors, that open as one. Blackboards are affixed to the outer side of these doors, while clothing hooks are screwed both on the inside and along the wall. The doors also have small trays for odds and ends. Compared with the usual cloakroom, this wardrobe represents a saving in space of about two-thirds.

Open for Use as a Wardrobe: Hooks for Hanging Clothing Are along the Wall and on the Inside of the Doors



Closed and Ready for Use as a Blackboard: Notice a Ridge on Each Door for Holding Chalk. Beneath the Ridges Are Slits Opening to Small Trays for Books, Rubbers, or Other Odds and Ends

CIVIC FEATURES THAT PROMOTE THE COMFORT

These Concrete Loading Platforms Are 12 Inches above the Street, and were Built by the Los Angeles Street-Railway Company to Prevent Reckless Motorists from Crowding or Injuring Prospective Passengers

In Memory of the Church Activities of a Morgan Park, Illinois, Woman, This Artistically Designed Drinking Fountain has been Erected, Showing a Child Holding a Squirrel Which is Gnawing a Nut

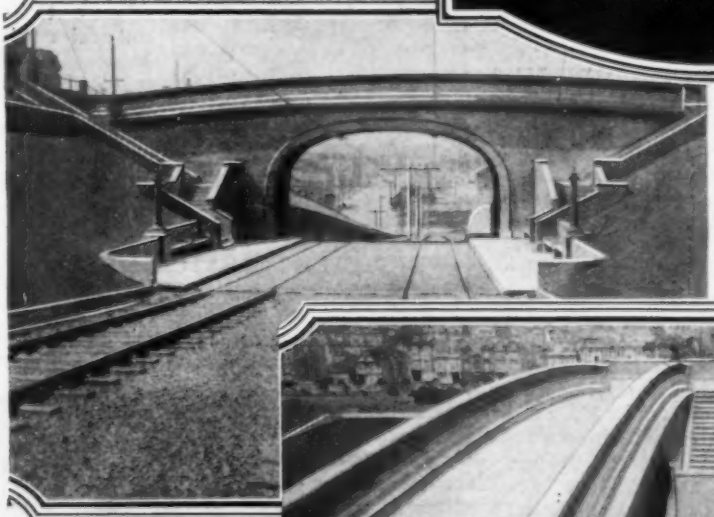
On This Post above a Front Porch in a Pacific-Coast City, is Mounted an Electric Lamp Which is Kept Lighted to Guide Visitors

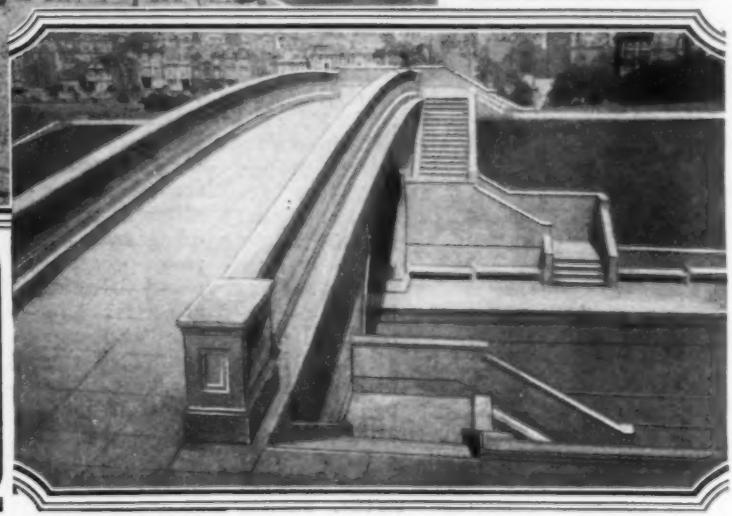
In 1764, This Blockhouse, Located on What is Called the "Point," at the Junction of the Allegheny and Monongahela Rivers in Pennsylvania, was Added to Fort Pitt to Strengthen the Defenses of Pittsburgh, Then a Small Village

AND ENJOYMENT OF VISITORS AND RESIDENTS

Motorists Stopping in the Public Automobile Camp in Woodland Park, Seattle, Washington, Make Good Use of This Huge Stove Which Accommodates 24 Cooks. A Tank is Included in the Outfit and Yields Boiling Water at Any Hour of the Day or Night

When Passing through the City of Bristol, Located on the Virginia-Tennessee State Line, This Gigantic Electric Sign can be Seen. It is Mounted 200 Feet from the Railroad Station, 150 Feet in the Air, and on a Clear Night Is Visible from the Mountains, 18 Miles Distant

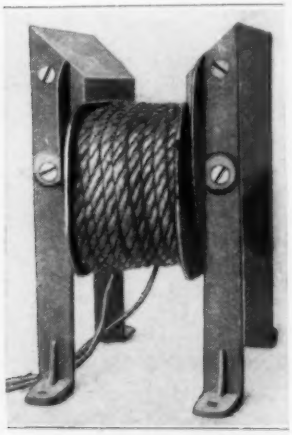




Above can be Seen the Artistic Arch of the Viaduct over the Church-Street Car Lines in San Francisco, California, with Seats for Prospective Passengers at Its Base. At the Right Is Another View of the Viaduct Which Graphically Illustrates the Beauty of the Work

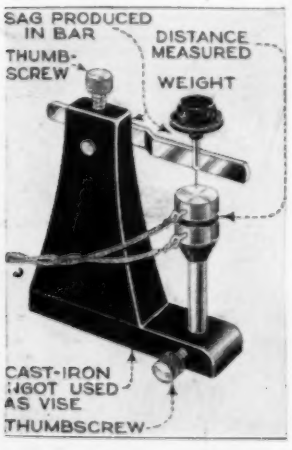
"GROWLER" ROPE WINDING AS HEAT CONDUCTOR

The "growler," an electrical appliance used in testing for grounds or short circuits between the coils of an armature, has been improved upon by a Lincoln, Neb., man. These growlers, which are so named because of the peculiar noise emitted by them during the testing operations, usually become excessively heated under continued use. The new unit has on the outside of its coils, a winding of heavy rope, which is claimed by the inventor to be a better conductor of heat than is air, thus narrowing the possibility of burning out the apparatus.



ELECTRIC MEASURING DEVICE FOR MINUTE DIMENSIONS

Measurements as infinitesimal as one five-hundredth of a millionth of an inch have been made by an electric measuring device recently constructed at the University of Cincinnati. The instrument has an iron deflection bar 2 inches long and 1 inch thick, and when supported at one end, the deflection caused by the weight of a house fly on this bar has been measured. The device has been utilized in the field of radio experimentation. If two continuously oscillating radio frequency circuits of slightly different frequencies are coupled to a common secondary circuit having nearly the same natural period, an audible beating note will be set up. The unit of value of a variation of one beat a minute is first determined, and variations set up in the beats form a basis which makes the calculation of the minute measurements possible.



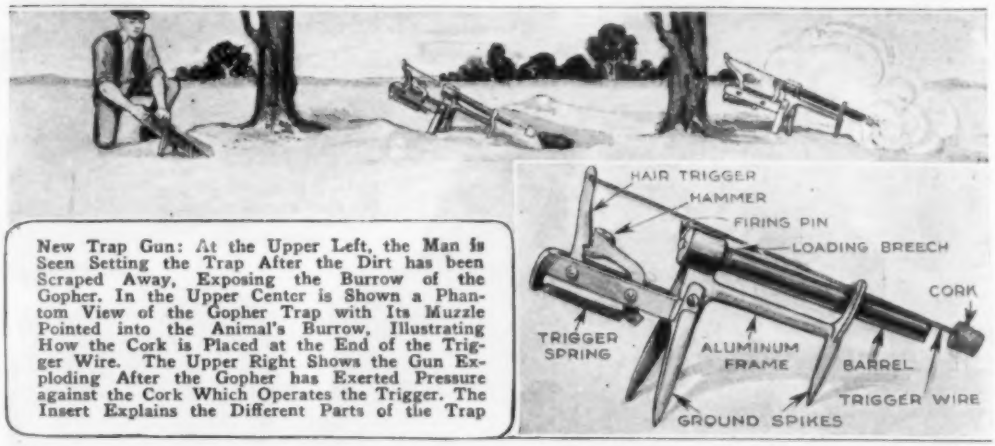
LAMP MADE OF COWS' HORNS GIVES MELLOW GLOW

Cows' horns have been used in the construction of an ornamental table lamp, the finished product yielding a beautiful mellow glow. The horns were rubbed down with emery cloth until they became thin enough to permit the rays of the electric lamp to penetrate them and disclose their natural coloring. All the pieces are perfectly fitted together, and even the small nuts that hold the parts to the frame are made of polished horn, thus adding to the effect.

EFFICIENT DEVICE HOLDS CARS SAFE IN TRANSIT

Some automobile manufacturers are using a new fastening for holding down the wheels in rail shipment. Each wheel is prevented from moving sideways or endways by two pressed-steel blocks that fit the tire and are spiked to the car floor. The wheel is held down by a U-shaped rod which ends in a plate, bolted to the floor, and is suitably padded to avoid marring the spoke and rim.

GOPHERS COMMIT SUICIDE WITH NEW TRAP GUN



New Trap Gun: At the Upper Left, the Man is Seen Setting the Trap After the Dirt has been Scraped Away, Exposing the Burrow of the Gopher. In the Upper Center is Shown a Phantom View of the Gopher Trap with Its Muzzle Pointed into the Animal's Burrow, Illustrating How the Cork is Placed at the End of the Trigger Wire. The Upper Right Shows the Gun Exploding After the Gopher has Exerted Pressure against the Cork Which Operates the Trigger. The Insert Explains the Different Parts of the Trap

A self-exploding gun for the extermination of pocket gophers is now being used by a number of farmers who are bothered with these pests. It is also used, in some cases, against rats, ground squirrels, and skunks.

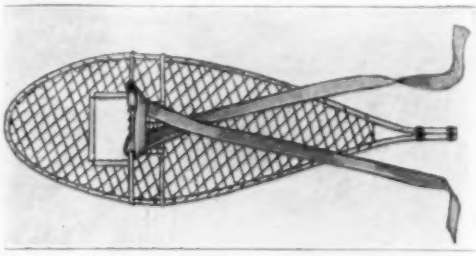
The gun looks like a miniature cannon. It is mounted on an aluminum frame with three ground spikes so arranged that the barrel can be pointed directly into the gopher's runway. It shoots a standard .410 shotgun shell. In setting, the dirt is first scraped away from the hole. The gun is then spiked into the ground with the barrel pointing down into the burrow. A small piece of cork or cob is placed over the end of the trigger wire. With the trigger cocked and set, and the firing pin in place, the gun is ready for the discharge. As the gopher always tries to keep out all light from its runway, it will soon come up, pushing fresh dirt into the opening. The slightest pressure on the trigger-wire cork releases the hammer, and bang! the full charge of the shot hits the gopher in the face. The gopher virtually commits suicide.

HORSESHOE-PITCHING ARENA HAS TWENTY COURTS

What is said to be the largest horseshoe-pitching arena in the United States was built at Des Moines, Ia., for the national horseshoe-pitching tournament, held at the Iowa State Fair in the last week of August. The arena contained 20 courts, all of them surrounded by bleachers. Women contestants used four, while the rest were occupied by men. Thirteen hundred dollars in prizes were awarded to the winners.

METAL SNOWSHOE DESIGNED ESPECIALLY FOR CHILDREN

Because there is no gut to be eaten or destroyed by ice, and because it is much lighter in weight and cheaper, an eastern company is manufacturing a metal snowshoe which it claims is practically indestructible. None of the standard features of the ordinary shoe have been changed, except that nonrusting metal has been substituted for the gut weave and for the wooden frame. This makes a lighter shoe which is especially useful for children.



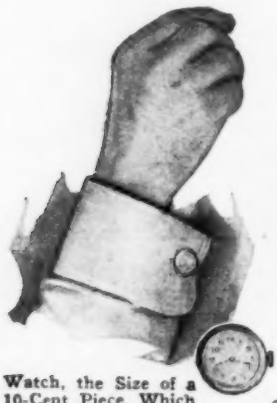
Nonrusting Metal is Used in the Construction of This Snowshoe Instead of the Regular Gut Weave and Wood

¶We want all our readers to write us freely and often whenever they wish additional information on articles published in this magazine. Address Bureau of Information, Popular Mechanics, Chicago.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

Electric Curling Iron Which Has a Swivel Attachment to Prevent the Cord from becoming Twisted

Rubber Heels Which can be Easily and Quickly Attached to Any Ordinary Slipper



Watch, the Size of a 10-Cent Piece, Which may be Used as a Cuff Link

Children's Bib, Which Has Sleeves in It to Protect the Garments and is Made of White Rubber So That It can be Easily Cleaned without Going into the Weekly Wash

Transparent Moth-Proof Garment Bag That Does Away with Search of Many Bags Before the Desired Garment is Found

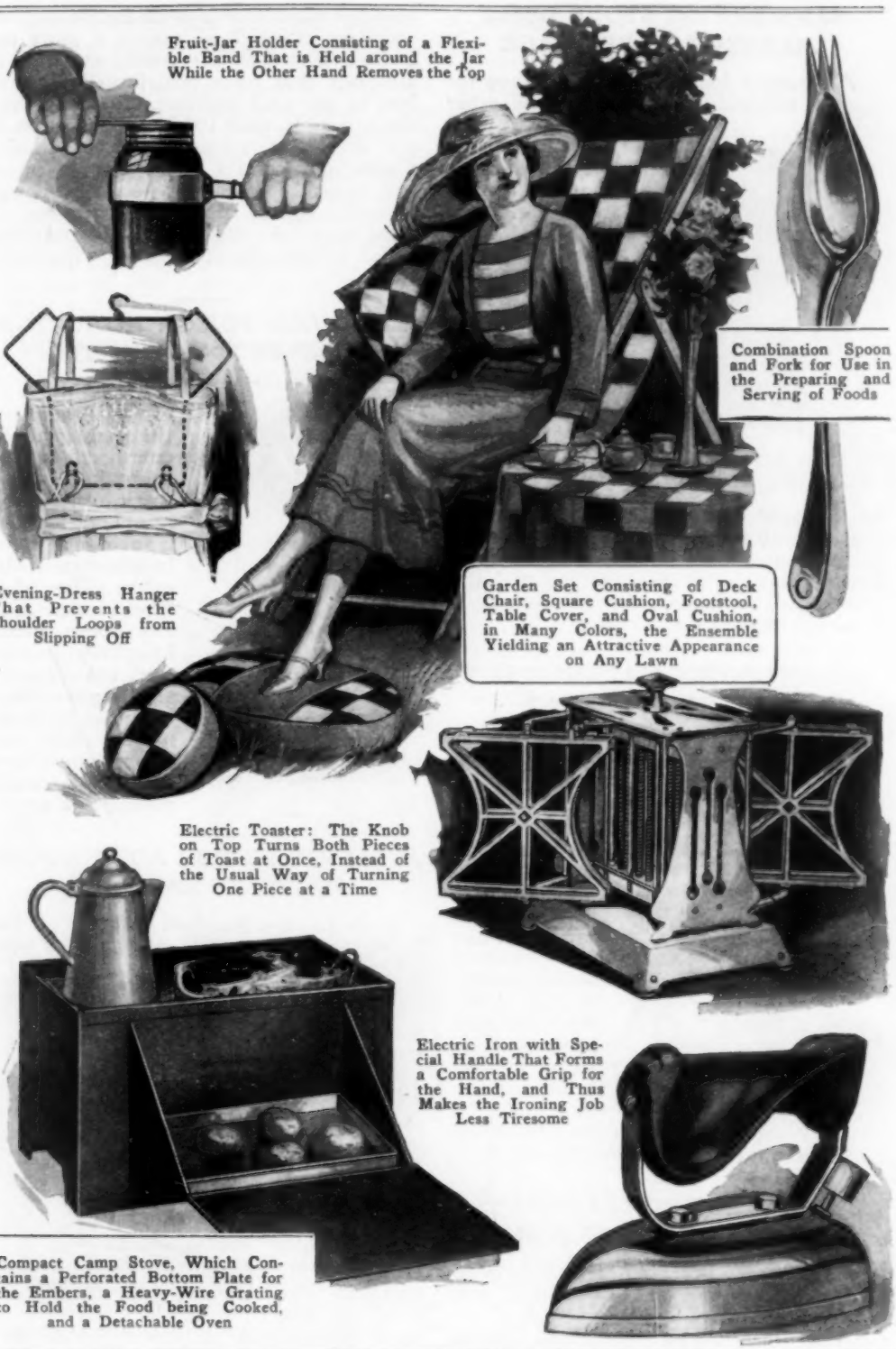
Soap Container to be Hung on Edge of Pail When Scrubbing

Bake Pot, and Some of the Pans That Go with It: The Pot is Designed to be Placed on Top of the Stove over the Gas Flame

Pantry Cabinet That is Ventilated, Rustproof, and Has Two Shelves Which can be Removed for Cleansing

Electric Hot Plate Which can be Used for Heating the Coffeepot, Making Toast, or Warming Baby's Milk at the Bedside

Anyone wishing further information on devices described in the editorial pages can



Fruit-Jar Holder Consisting of a Flexible Band That is Held around the Jar While the Other Hand Removes the Top

Combination Spoon and Fork for Use in the Preparing and Serving of Foods

Evening-Dress Hanger That Prevents the Shoulder Loops from Slipping Off

Garden Set Consisting of Deck Chair, Square Cushion, Footstool, Table Cover, and Oval Cushion, in Many Colors, the Ensemble Yielding an Attractive Appearance on Any Lawn

Electric Toaster: The Knob on Top Turns Both Pieces of Toast at Once, Instead of the Usual Way of Turning One Piece at a Time

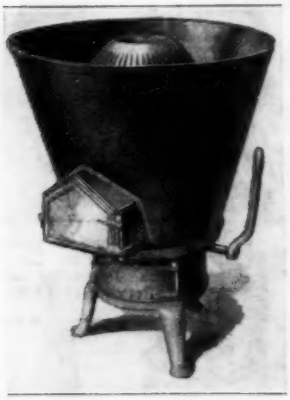
Electric Iron with Special Handle That Forms a Comfortable Grip for the Hand, and Thus Makes the Ironing Job Less Tiresome

Compact Camp Stove, Which Contains a Perforated Bottom Plate for the Embers, a Heavy-Wire Grating to Hold the Food being Cooked, and a Detachable Oven

obtain it by addressing Bureau of Information, Popular Mechanics Magazine, Chicago.

SAND-DRYING STOVE BUILT TO RESIST HARD USAGE

A strongly built sand-drying stove for use on railroads, in foundries, and other industrial plants, has a small furnace at its center which is surrounded by an upright cast-iron grating. Around this again is a conical skirting that incloses the space into which the wet sand is shoveled. As soon as the sand is dry, it runs through the grating into the hot-air space around the furnace, and then out through a perforated ring below the skirting and the grating. The furnace is fed through a fire door outside the skirting.



USE CYLINDRICAL LUNCH BOX AS EXTRA AUTO SEAT

A fiber lunch box which can be used as an extra auto seat has been designed to aid the motorist who desires to minimize the space taken by outing equipment. The box looks somewhat like an oversized vacuum bottle. A tray held by three uprights forms an "elevator" which is lowered as the box is filled. When the contents are wanted the lid is removed and the elevator raised.

LIME-SECRETING SEA PLANTS HELP IN REEF BUILDING

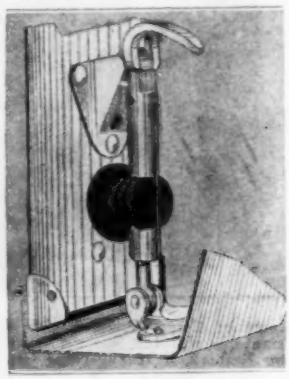
The generally accepted idea that corals alone play any part in reef building was disputed recently by Dr. Marshall A. Howe in a lecture on "The Plant Life of the Sea." He stated that recent researches show that in some localities lime-secreting plants have played a more important part than the corals, and that in all cases they have contributed more or less to the reef building. Doctor Howe showed more than 100 lantern pictures of the more interesting forms of marine plants, particularly those known popularly as seaweeds and mosses. He showed how the minute inclosing membranes of these organisms are permeated with silica, which renders the plants almost imperishable.

LUMINOUS POISON INDICATOR PREVENTS ACCIDENTS

Accidents caused by taking the wrong medicine or poison by mistake, in the dark, may be averted by the use of a new luminous indicator. The label, when fastened to any bottle, glows brightly in the darkest places, and is guaranteed to retain its luminosity for five years, when kept within the usual medicine chest.

ATTACHMENT FOR AUTO HOODS PREVENTS RATTLING

Made to fit a standard fastener on the hood of an automobile, a device for preventing the hood from rattling is now on the market. It is made of rubber, in one piece, and is attached to the rod of the hood fastener. In connection with it is a small vacuum cup that fits against the side of the hood and prevents it from moving. Being made of rubber, it is very durable.



BIRDS ANSWER DINNER BELL AT STATE GAME FARM

Answering the dinner bell is one of the joys of bird life on the State Game Farm at Forked River, N. J., where thousands of pheasants are reared annually. Every effort is made to raise the young birds as near to wild methods as possible, since they are to be ultimately distributed for hunting purposes, but the scarcity of natural food has necessitated the introduction of one domestic trait, namely—"first call to dinner."

FORESTERS RISK HIGH CLIMB AS PART OF DAILY ROUTINE

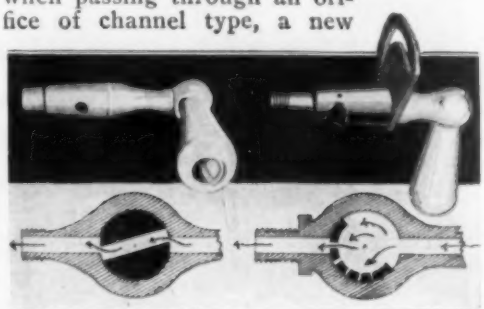
Climbing a 100-foot ladder is the first job in the day's routine of a Canadian forest patrolman located in the province of Saskatchewan. Such towers are common in this service, but it is not often that the cameraman has an opportunity to snap the forester "en route." The accompanying photograph gives a good idea of the size of the towers and of the risk involved in climbing them. This takes about five minutes.

PECULIAR WRECK OF AIRSHIP LANDS CREW IN SEA

An unusual accident recently happened to an Italian airship which, returning from a trip over the Gulf of Taranto, encountered a storm. The fastenings between the car and gas bag broke, dropping the car and its 20 occupants 600 feet into the sea. Boats from shore were in time to rescue the crew.

DESIGN OF NEW GAS VALVE IS RADICAL DEPARTURE

Taking advantage of the fact that there is less loss of pressure in a gas when passing through a thin-walled orifice than when passing through an orifice of channel type, a new valve for gas-range burners has been designed that is a radical departure from the usual valves. Instead of one straight opening through the movable plug, there are a series of openings of graduated diameters, all connecting with the supply side of the gas main. This construction results in a considerable increase in efficiency.



Loss of Gas Pressure in the Valve of a Gas-Range Burner is Remedied by Using a Number of Graduated Diameters Instead of the Usual Movable Plug

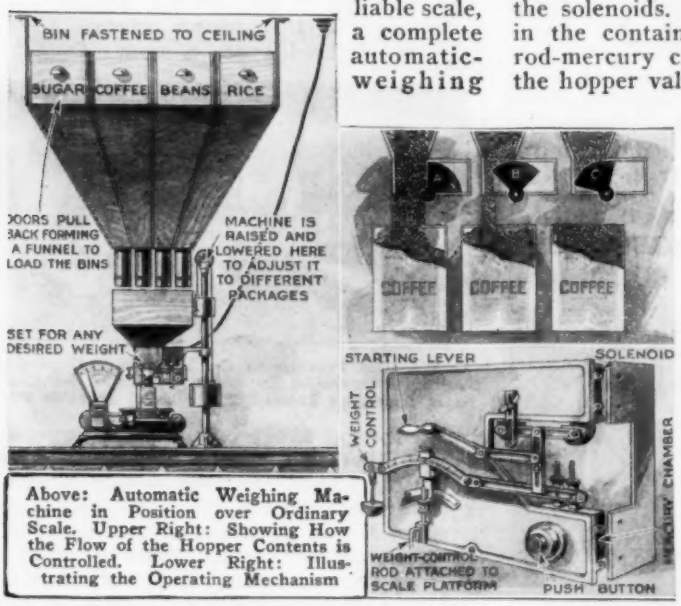
LINOTYPE-SLUG ADJUSTER HAS ANTIFRICTION ROLLER

For the convenience of linotype operators who have had trouble with the slugs of type getting out of alinement or sticking in the slide, as they pass from the knife block to the slug tray, an adjuster, intended to overcome this trouble, has been patented. It holds a roller made of antifriction metal against the face of the slugs as they come from the knife block, insuring even delivery to the slug tray.

¶Those wishing further information on anything described in the editorial pages can obtain it by addressing Bureau of Information, Popular Mechanics Magazine, Chicago.

DEVICE CONVERTS ANY SCALE TO AUTOMATIC MACHINE

By attaching a recently invented electromagnetically operated device to any reliable scale, a complete automatic-weighing unit is formed. The apparatus is readily connected to any size or form of hopper, and allows only an exact quantity to pass through an opening, which closes automatically when the predetermined weight has been reached. It is also adjustable to take care of the variations in weight of the containers, and gives in all cases the actual net weight of the product weighed. It is possible, without any inconvenience, to check its work by reading the dial of the regular scale. No changes in the adjustment of the scale are necessary.



Above: Automatic Weighing Machine in Position over Ordinary Scale. Upper Right: Showing How the Flow of the Hopper Contents is Controlled. Lower Right: Illustrating the Operating Mechanism

The accuracy of the device is remarkable. In one instance a pound of beans was placed in the hopper. Three of the beans were removed. The pound of beans minus the three beans was delivered to the receiving container, but the hopper valve did not close. As soon, however, as the three missing beans were placed in the bag, the valve closed automatically. Such a degree of sensitiveness surely is not within the reach of the average clerk.

The hopper valve is electrically controlled by two solenoids. Assuming that the desired weight has been adjusted on the curved weight-control arm, the starting lever is pulled down. This changes the position of the hopper valve, allowing the material to discharge into the waiting container. As the scale platform descends, the weight-control rod gradually lifts out of a mercury chamber a rod that completes the electrical circuit maintaining the magnetic properties of the solenoids. When the desired weight in the container has been reached, the rod-mercury circuit will be broken, and the hopper valve will close.

TENNIS COURTS COVERED WITH ROOFING

A tennis club of St. Louis, Mo., has recently converted its outside clay courts into courts that may be played upon during wet weather and during the winter months. Cinders and an application of roofing material did the trick. First, 6 inches of clay were removed from the courts. Coarse cinders were then obtained and put in place of the clay. After rolling and packing the first course of cinders, another layer of finer cinders was applied, which raised the courts one inch higher than the surrounding ground and thus facilitated drainage. The courts were then leveled, and two layers of three-ply roofing material were laid across the courts, in opposite directions. The net posts were left in the same position.

NOVEL PISTON TO KEEP OIL FROM COMBUSTION SPACE

Carbonization in gasoline-engine cylinders largely results from oil leakage from the crankcase past the piston into the combustion chamber. A piston designed to eliminate this, provides a cupped groove to break the capillary action and to catch the oil. Holes through the piston wall equalize the pressure on the oil, draining it back into the crankcase, also increasing ring pressure against grooves and cylinder walls.

CHROME-PLATING POSSIBLE BY NEW PROCESS

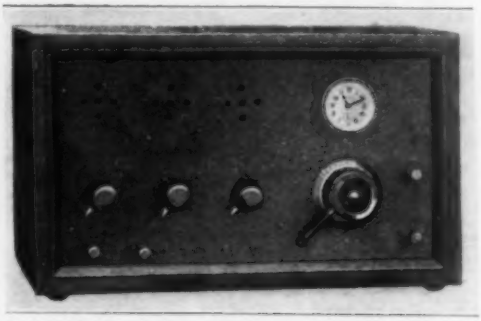
Chromium can now be deposited as a thin coating on the surfaces of iron, steel, and other metallic objects, similar to nickel and copperplating, by the process of a German chemist. The important properties of chromium are its resistance to corrosion and abrasion, and its relatively high melting point. The availability of this useful metal has been considerably extended, because it has only been prepared with difficulty by any of the processes heretofore devised.

TUBE FOR GASOLINE TANKS PREVENTS EXPLOSIONS

A tube which eliminates the danger of explosion of gasoline has been indorsed by insurance underwriters for use on automobiles and other types of gasoline tanks. The ordinary intake cap is replaced by a cap with a springed hinge which keeps the cap closed. Attached to the base of the cap is a cylinder with small perforations, inclosed a fraction of an inch away by a brass strainer. Neither flame nor gasoline vapor can penetrate this tube. And if the tank is subjected to excessive heat, the cap opens automatically, releasing pressure and preventing combustion. Due to the fact that the air hole in the smaller tube attached to the cap closes automatically when the engine stops, the tank can be left for months without impairing the quality of the gasoline or losing any by evaporation.

CLOCK INCREASES EFFICIENCY OF RADIO-RECEIVING SET

Since nearly all important broadcasting stations publish their schedules in the newspapers giving the time of day, program detail, etc., the idea of the manufacturers of a new two-step nonregenerative honeycomb-coil receiving set to incorporate in it as standard equipment a neat clock, seems a happy one. The timepiece is set flush with the panel of the instrument, and, to radio fans within receiving distance of two or more broadcasting stations, this will be a welcome innovation.

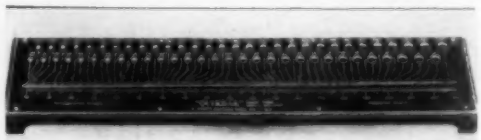


Clock Mounted in a Radio-Receiving Set, Which the Operator Watches for the Schedule Time of a Broadcast

Knowing the transmitting schedule of the various stations, it will no longer be necessary to keep the receiving set on "closed circuit" for 5, 10 or 15 minutes in order not to miss a broadcast.

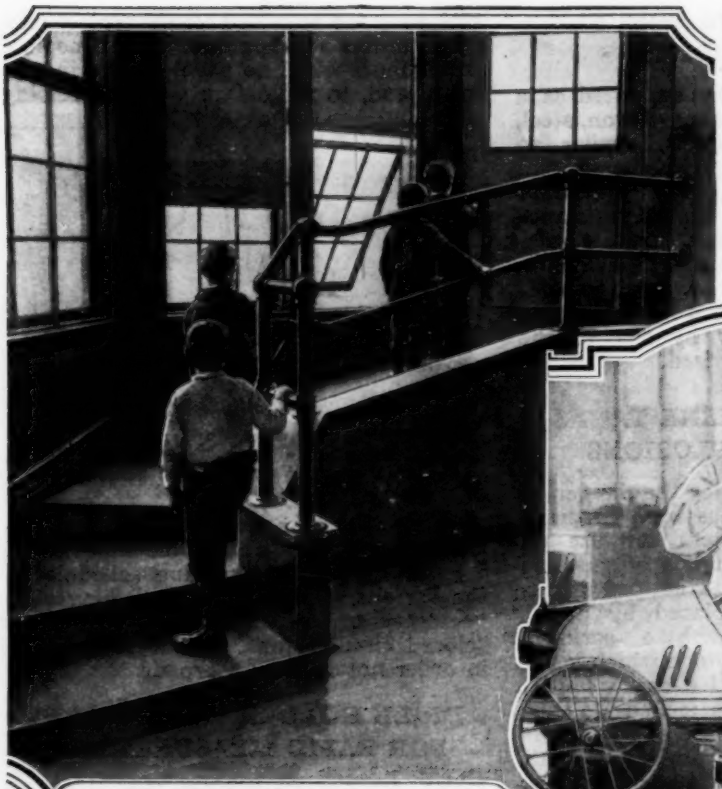
DRILL HOLDER WITH GAUGE FOR RAPID MEASUREMENT

For rapidly measuring the sizes of drills being manufactured, a holder that has, besides the usual holes for the drills, a long tapered slot in which the gauge of a drill can be instantly determined, is now available. Along the side of the tapered slot is a scale, graduated in thousandths of an inch, and from each point in this scale that corresponds to the number of a standard gauge, a guide line leads to the proper hole for the drill. The base is made of cast iron, but the tapered slot is lined with hardened and ground steel.



Drill Gauge and Holder: Drills are Measured by Placing Them in the Tapered Slot, Seen with a Scale along Its Side Graduated to Thousandths of an Inch

¶A mocking bird is giving a poultry fancier of Saluda, N. C., considerable trouble by imitating the clucking of a hen and thus luring baby chicks from their mother, so that he has to chase them among weeds and undergrowth.



Flight of "Baby Stairs," Built with Very Low Risers, So That the Smallest Tot can Mount Them: They Lead from One of the Kindergarten Rooms to the Play Roof at the Michael Angelo School in the Italian Quarter of Boston. Around the Roof Is a High Brick Wall Guarded by a Curved Iron Rail

Below: Most Kiddies Are Restless in an Ordinary Barber Chair, but Never in One of This Kind—the Longer the Barber Takes to Cut Their Hair, the Better They Like It. Since This Barber Rigged Up the Cute Little Auto to Act as a Chair, He has Become the Kiddies' Favorite

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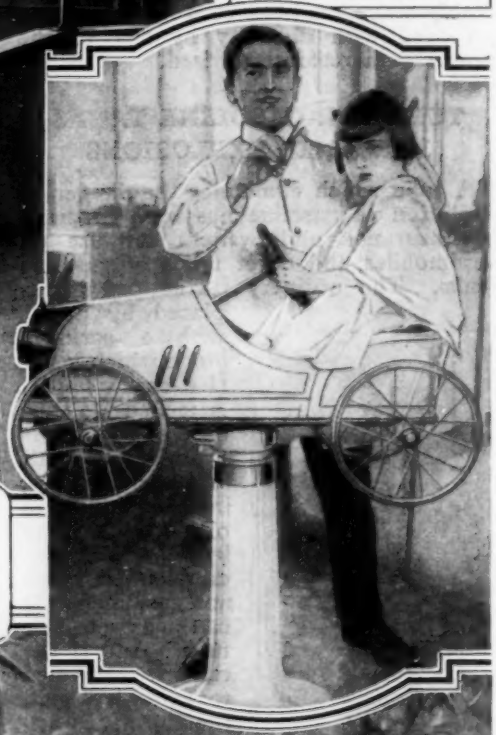

Mr. Porcupine and Mr. Coon, Both of Whom Are Tree Climbers, Very Seldom Meet in This Way, For Mr. Porcupine Attends to Business in the Daytime, While Mr. Coon Is a Sun Dodger. When They do Meet, Mr. Coon Gives Mr. Porcupine the Right of Way

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Eleven Pretty Girls, All High-School Students at Washington, District of Columbia, Wearing Sweaters of Their Own Handiwork That Won Prizes in a Recent Contest: The First-Prize Winner Is Seventh from the Left; the Second Winner Is Just behind Her, and the Third Is at the Extreme Left

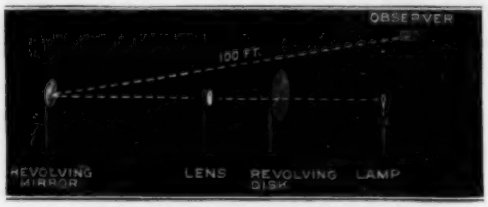
Pencil Case and Lightning Calculator: By Placing Any Two Numerals at the Left End Side by Side, Their Multiplied Product is Shown in Line with Them in the Slot to the Right

This Lucky Rooster, "Duke," was Doomed to the Cookstove, but He Saved His Neck by Doing Tricks. Here He is Riding the Handlebar of His Master's Bicycle

This Dog does Not Wear a Cap and Gown, but Makes an Excellent Nurse Just the Same. "Brownie," as the Wonder Dog is Called, Holds the Bottle Just the Way Baby Likes to Have It

HOW LONG DOES IT TAKE TO SEE A THING?

Two British scientists, Professors Joly and Poole, have recently made measurements to determine what time is necessary to arouse the sense of vision in the human eye. The apparatus used for the purpose consists of a mirror, capable of



Apparatus Used in Making the Tests to Determine the Length of Time Required to Arouse the Sense of Vision in the Human Eye

rotating 8,000 revolutions per minute; an incandescent lamp, so arranged that a lens focuses the filament (used edge on) upon a slit behind which is the observing eye. With the mirror in rotation the eye will receive flashes of light due to the image of the filament crossing the slit, but these flashes will succeed each other so rapidly that persistence of vision will make the illumination apparently steady. In order to deal with just one flash at a time, a revolving disk, having a sector cut out, is interposed between the lamp and lens. This disk makes about 120 revolutions per minute, and the cut-out sector is so narrow that, while the light from the lamp is passing through it, the mirror does not have quite time enough to complete one revolution. Thus the eye receives only two flashes per second, and distinctly perceives the individual flashes.

The whole apparatus is placed in a darkened room and the observing eye is allowed to remain in the dark at least 20 minutes before observations are begun. (An eye that has rested in the dark may be as much as 10,000 times more sensitive than when in a lighted room.) Knowing the width of the observing slit and the width of the image of the filament, and also the rate of rotation of the mirror and the distance of the slit from the mirror, the investigators have been able to show that a flash of .0000002 second is still visible, while a flash of a duration of .00000008 second is found to be invisible.

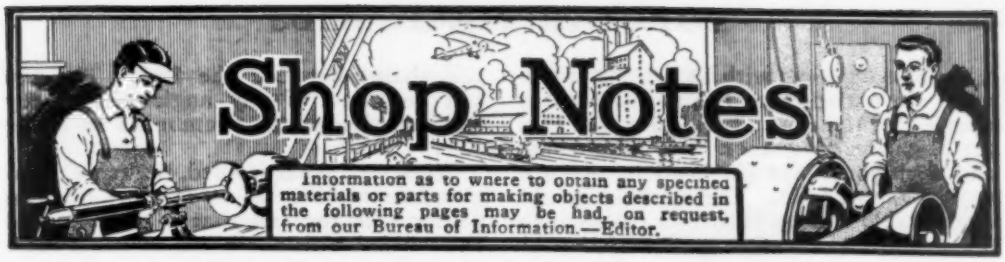
It is of interest to note that since the speed of light is 186,000 miles per second, the length of the beam of light entering the eye in .00000008 second is approximately 80 feet. Assuming 50,000 waves of light to the inch, it is evident that 48,000,000 light waves register their tiny blows upon the retina during this minute interval of time.

NEW FORM OF SQUIRREL-CAGE INDUCTION MOTOR

All the advantages of the squirrel-cage induction motor, without the necessity of using a wound rotor with slip rings where a high starting torque is necessary, are embodied in a new type recently devised in Germany. The end rings of an ordinary squirrel-cage motor are cut at a number of points so that the current in the rotor has to follow a zigzag path through one bar after another instead of flowing through all the bars in parallel. This has the same effect as the slip rings, and will give about 1¼ times full-load torque with a starting current equal to twice the rated current. Centrifugal contacts close the cuts in the end rings when the motor is up to speed, and thus restore the winding to the regular squirrel-cage form.

FILLER FOR BATTERY CELLS PREVENTS OVERFLOW

To fill storage-battery cells without fear of overflow and slopping of the electrolyte, is possible with a filler having an electrical indicator that includes a tiny lamp. The appliance is affixed at the end of a small hose and contains a trigger-like arrangement with which the flow of water is controlled. When a certain height of liquid is reached in the cell, the small lamp lights, thus enabling the user to shut off the flow and prevent any waste. By this method, the adding of water to the battery cells is made a simple, easy, and clean task.


Shop Notes
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

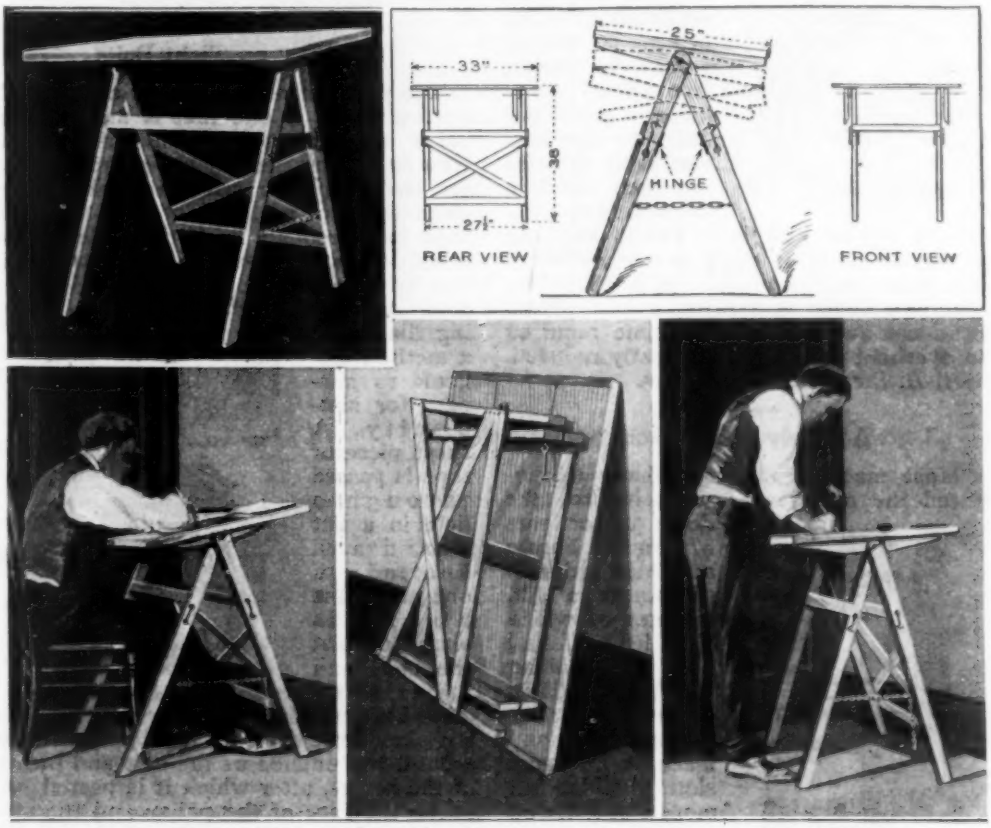
A Convenient Folding Drawing Table

By EUGENE F. DAWSON

ARTISTS, draftsmen, and students of mechanical drawing, who find it necessary to do more or less of their work and study at home, will appreciate the desirable features combined in the folding drawing table illustrated. Unless the amount of work done is great enough to justify it, the standard drawing table cannot be used, as it occupies considerable room—usually at a premium in the home. The table described, however, is light, but strong, and when not in use, can be folded and stored away in little more space than that required for an ordinary drawing board.

When the table is folded, the legs fit snugly underneath the top, making the whole 5½ in. deep. The legs are about 36 in. long, and are cut and hinged, 12 in. below the thumbscrew bolts, by which they are pivoted to the top.

The table top is made from an ordinary drawing board, 25 by 33 in., which is large enough for most purposes. The legs are



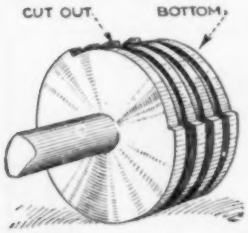
Upper Left: The Complete Table. Upper Right: Constructional Details. Lower Left and Lower Right: The Height of the Table Varied to Conform to the Posture of the User by Lengthening or Shortening the Chains That Hold the Legs Together. Center: Table, Folded

fastened to battens with bolts and thumbnuts, the battens also helping to prevent warping of the top. It will be noted that the legs are hinged on the inner sides, and that hooks are provided to make a rigidly locked joint. The working height of the table can be varied to conform to the posture of the user, either sitting or standing, by lengthening or shortening the chains between the legs. The top can be tilted to any angle desired, by manipulation of the thumbnuts on either side.

When completely folded, the table occupies a space 33 by 25 by 5½ in.; this, together with the fact that it can be lifted and carried with one hand, makes it most convenient for the purpose intended.

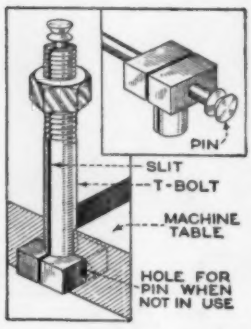
Renewing Locomotive Piston Heads

A western railroad has solved the problem of renewing locomotive piston heads, which had previously been one of their most troublesome and expensive repairs. The worn piston heads are now placed on the slotter and a small cut, generally about ¼ in. deep, is taken across, as shown, for about two-fifths of the diameter, on the bottom side; the ribs are then filled in with bronze by means of an acetylene torch, and the piston is made as good as new, after it has been re-turned in the lathe. The cost and delay of making a new piston head are avoided, and the time required to overhaul the engine is greatly reduced. —A. A. Strafford, Reno, Nev.



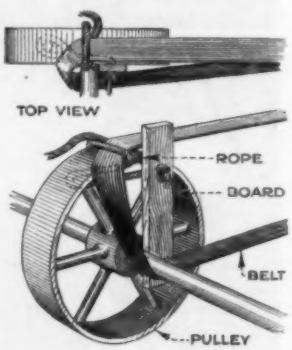
A Handy Split T-Bolt

Most machine operators have experienced the annoyance of having to take down all or part of an elaborate set-up in order to slide an extra bolt, the use of which has been found necessary, along the T-slot. This, of course, may happen on any machine having a slotted table, but more especially on milling machines, where an extra bolt is often needed and the slot is blocked at both ends. A pair of split T-bolts, such as that shown in the drawing, will make it possible to avoid disturbing the set-up in practically every case. The heads on these bolts should make a good fit in the slot. A hole is drilled lengthwise through the bolt to take a pin, and another, of the same diameter, is drilled through the head, in which the pin is placed to hold the parts together when not in use. To insert the bolt, it is only necessary to drop the halves into the slot, slide them to a position opposite each other, and insert the pin, as shown in the drawing.



Putting on Tight Belts

The problem of how to get a tight belt onto a pulley is one that is met with in every shop at some time or another. New belts are generally cut short to allow for the inevitable stretching that takes place when in use, and, while a belt will soon accommodate itself to the length of drive, considerable force is required at first to place it on the pulley. Various devices are used to do this, but the drawing illustrates a method difficult to surpass for simplicity. A short piece of rope is passed through a hole in a flat board and knotted on one side. The board is placed against the belt, and the rope looped around the nearest arm of the pulley, then brought back and passed once around the outside of the belt and inside of the pulley, after which it is passed between the face of the pulley and the underside of the belt, and pulled tightly. When the shaft is turned, the pulley arm pulls the board around, while the belt binds the loose end of the rope tightly between it and the face of the pulley until the belt is properly placed. The board will fall away when the rope is released by the belt. Of course, the shaft should be revolved as slowly as possible.



A Novel Wire Gauge

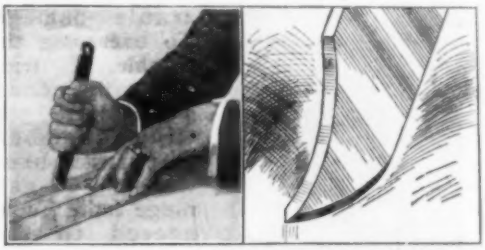
A peculiar form of wire gauge, especially useful to electrical workers, is a card or piece of metal having mounted on it short straight pieces of wire of every size within the range desired, each size being marked with the proper number. The wires should project for a short distance beyond the edge of the card. By holding this gauge close to any other piece of wire, it is easy for the eye to pick out the wire on the card which has the same diameter as the piece to be gauged. —Curtis Ralston, Chicago, Ill.

An Oil Dropper for the Oilstone

Using kerosene as a lubricant on the modern sharpening stone makes a very fast and free-cutting tool, but, unlike the old-fashioned stone sprinkled with thick oil, fresh oil must be applied each time it is used. In most cases the oil is applied from oil-cans or even open cans; this is wasteful, as much of the oil runs off the stone altogether. A certain definite feed can be obtained in a simple manner, as shown in the illustration, where the oilstone is held on a wooden stand, and a glass bottle used to hold the kerosene. The ends of a piece of tin wrapped around the bottle are secured by a nut and screw, and the bottle is held at a convenient height, out of the way, by passing some ⅛-in. wire through a hole in the tin and bending it double, afterward driving the ends into the wooden stand. Above and below the hole in the tin, the ends are bent at right angles to form a stop that holds the bottle in a vertical position. A cut is made in one side of the cork stopper, and the feed is regulated by pushing in the cork more or less tightly. No oil is wasted by this device, as the drops fall on the center of the stone, and the oil is evenly distributed over the surface by the movements of the tool being sharpened. When not in use, the bottle is turned right side up in the clamp.

Knife for Cutting Sheet Metal

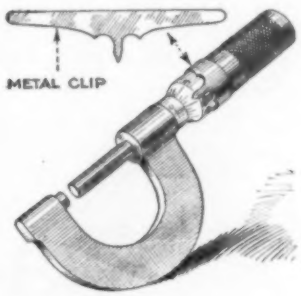
Those who have difficulty in cutting tin, or other thin sheet metal, straight and without curls, will appreciate the tool illustrated. The knife is made from a part of an old power-hacksaw blade; one end of the blade is ground as shown, and the teeth are also ground off. In cutting sheet metal with this tool, a straightedge is placed on the line to be cut, and the cutter, with its point in contact with the metal and against the straightedge, is drawn toward the body. If a single stroke is not sufficient to cut the metal, the cut can be repeated, care being taken that the point of the cutter is always placed in the same groove. When the score is deep enough, the metal can usually be separated by bending it back and forth once or twice. When the point becomes dull it can be resharpened by grinding the face.



Cutting Sheet Metal Straight without Curls by Means of a Simple Tool Made from a Discarded Power-Hacksaw Blade

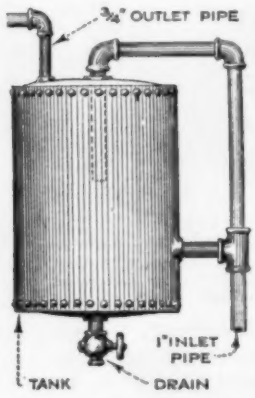
Quick-Reading Micrometer Attachment

A circular clip, that fits closely around the thimble of a micrometer, will be found very useful when turning or grinding a number of pieces to the same size; by means of this, the mechanic is enabled to read the instrument at arm's length, avoiding the usual bending over the machine. The clip is made of sheet metal, and is formed so that it will have enough tension to grip the thimble of the caliper tightly. The pointer is set at the proper graduation on the thimble, making the subsequent reading of the caliper a very simple matter.—Percy W. Thomas, Beloit, Wis.



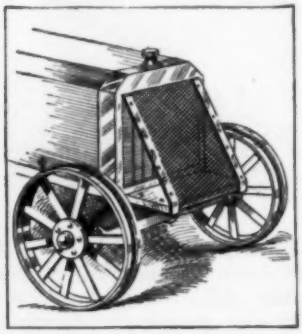
Settling Chamber for Water System

At one time the water from the city mains contained so much fine sand that pump valves, washers, and other parts, suffered considerable damage. To overcome the trouble, I tried out, with success, a simplified settling chamber. The tank used was a 100-gal. range boiler, connected to the water pipes as shown. The inlet and outlet pipes were made of different sizes, in order to reduce the force of a jet of water entering the tank, which would have tended to keep the water agitated, and prevented the suspended matter from settling to the bottom. The dotted lines show a pipe usually supplied with a range boiler, which should be removed when the boiler is to be used as a settling tank. A valve is provided at the bottom of the tank for blowing out the sediment.—James E. Noble, Toronto, Can.



Radiator Guard for Tractor

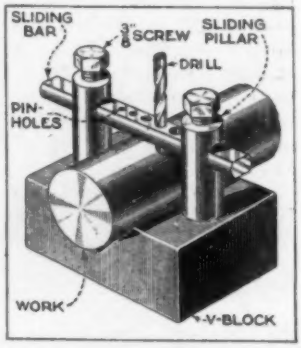
When plowing in brush land, or fields of heavy-growth cornstalks that have not been broken down, I have several times injured the radiator of my tractor. At one time a stick about 4 ft. long was thrown by one of the guide wheels so one end caught the radiator just as the other end struck the ground. The result was that, before the machine could be stopped, a hole was made through the radiator, breaking five of the tubes and bending many of the cooling fins. To prevent a recurrence of this, and also to prevent trash and corn husks from collecting over the front of the radiator when cutting or husking corn, the protector illustrated was fitted. It is placed far enough ahead of the radiator not to interfere with the functioning of the cooling system.



Two pieces of wagon tire, 40 in. long, were bent so that the lower part extended forward horizontally about 12 in., the rest of the stock being bent at an angle to meet the top of the radiator. One end of each iron was fastened to the tractor frame at the lower corners of the radiator, and the frame covered with a piece of heavy ¼-in.-mesh screen, attached with rivets. A board was fastened across the space at the bottom to prevent anything from striking the radiator from below. The trash which would formerly collect on the radiator and hinder cooling is now caught by the screen, and ample space is left back of this for the circulation of the air.—G. G. McVicker, North Bend, Neb.

Transferring Pinholes in Shafts

Trouble is often experienced with pinholes in worn shafts that are being replaced. Generally, only the shaft is sent to the repairman, with instructions to make an exact duplicate, which is easy enough so far as the diameter and length of the shaft are concerned, but, should the shaft carry collars or flanges pinned to it, a mistake is easily made, as pinholes are as likely as not to be off center. Unless the hole in the shaft matches up with the hole already drilled in the collar, or other part to be pinned to it, the pin will not enter unless it is filed away or otherwise fitted, the result invariably being an unsatisfactory job.



The special V-block shown in the drawing is very handy in cases of this kind, as it enables the operator to reproduce the exact position of the pinholes at once. On each side of the "V" a ¾-in. hole is drilled to take two pieces of cold-rolled steel, these pieces in turn being drilled through for a piece of ½-in. tool steel. This forms a sliding bar that is flattened on the top and bottom and drilled, as shown, for standard-size pins.

The method used in transferring holes is as follows: Place the old shaft in the

V-block, the other end being supported by another V-block, or by packing; then, with the sliding bar loose, insert the drill required in the chuck, and bring it down through the corresponding hole in the bar and through the pinhole in the shaft. Tighten the screws provided for clamping the sliding bar, which is now lined up exactly with the pinhole in the old shaft; the latter is removed, and the new one put in place, clamped down, and drilled. The uprights are not clamped in any way, but are pushed down until the sliding bar touches the shaft.

Knot for Wiring Electrical Fixtures

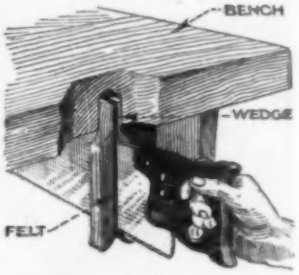
In order to relieve the terminals of lamp sockets, etc., of the weight of the shades, the ends of the wires should be knotted as shown in the drawing. The knot should be made so that the socket cap will bear against it and support the entire weight, or strain, which prevents the connections from being pulled loose. This knot is simple, and brings both ends of the wire out even. It should be pulled as tightly as possible, so that it will fit easily inside the cap.

Holder for Short Nails

Cabinetmakers, and others required to drive small nails in difficult positions, will lessen the chances of pounded fingers and marred work by use of the nail holder shown in the drawing. A piece of ¼-in. rod of suitable length is bent to the desired form, and the short end is flattened on opposite sides. A piece of spring brass or steel is riveted to one of the flat surfaces, to serve as a clip for holding the nails.

A Handy Saw Oiler

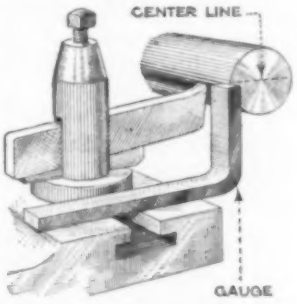
Oiling handsaws before storing them away for any length of time is essential if they are to be kept in good condition and free from rust, and if means are provided for doing this quickly and easily, the chances of neglect are materially lessened.



Cut two strips of pine, 1½ in. square by 10 in. long, and glue strips of felt to one side of each strip. Bore a hole in the underside of the workbench and secure the strips in the manner shown, with a wedge between them. The felt is saturated with a good grade of lubricating oil, and, by inserting the back of the saw in the slot, and drawing it back and forth several times, the tool will be covered with a thin film of oil.—G. E. Hendrickson, Argyle, Wis.

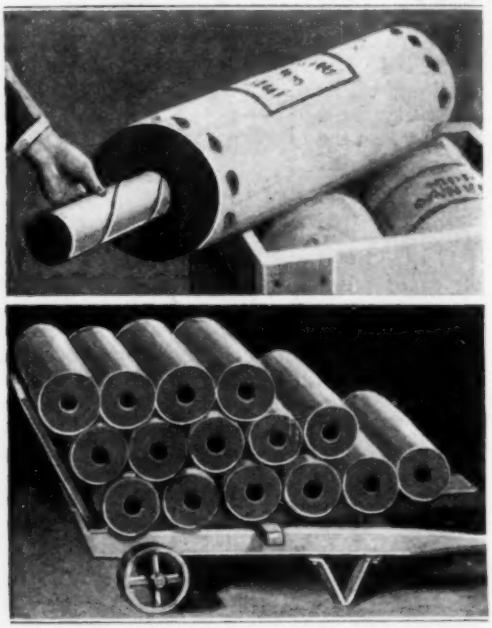
Gauge for Setting Lathe Tools

To give the best results, a lathe tool must be used with its cutting edge exactly on, or a little above, the horizontal center line of the work being turned. After years of machine-shop experience, the machinist is able to set his tool without measurement, but the beginner will find the gauge illustrated useful for setting the cutting edge of the tool at its proper height. A piece of mild steel, about ¼ by 1 in., is bent to make a right angle, one side of which is left considerably longer than the other. The short leg of the gauge is carefully ground, until its length exactly equals the vertical distance from the top of the toolpost block, or compound rest, to the center line of the lathe. The gauge is laid on the rest beside the toolpost, and the operator sets the edge of the tool even with the top of the gauge.—Lowell R. Butcher, Des Moines, Ia.



Preventing Rolls of Roofing Paper from Crushing

It is no longer necessary to crate rolls of prepared roofing paper for transportation in order to prevent the rolls from being crushed flat. One manufacturer of this product inserts two 18-in. cardboard mailing tubes into the center of each 36-in. roll of roofing paper. This arrangement has been found to give adequate protection against crushing, and as a result, the firm is able to quote more attractive prices on export shipments, because of the reduced freight charges on the product.—Chas. W. Geiger, San Francisco, Calif.



Cardboard Mailing Tubes, Inserted in Rolls of Roofing Paper, as Shown in the Upper Photo, Prevent Crushing During Transportation, as Shown Below

Removing Stains from Ivory

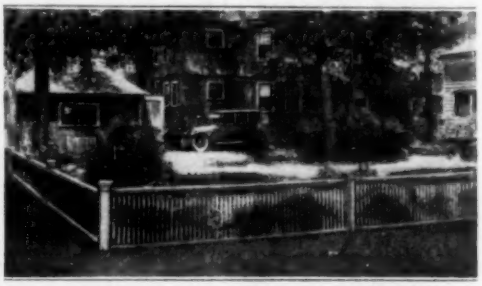
To remove brown spots from ivory, a bell glass or similar cover is required. Place some chloride of lime on a shallow dish, drop some hydrochloric acid on it, and put it underneath the inverted cover together with the object to be cleaned. The work should all be done in the open and in bright sunlight. The combination of the chlorinated lime and acid will generate chlorine gas, which should not be breathed, as it is highly irritating to the air passages. The powerful bleaching action of the gas will remove all discolorations due to age and many other causes. Any spots or stains not removed by the treatment should be rubbed with a lump of tripoli, finishing with fine-powdered rouge. After bleaching the ivory in the chlorine gas, the piece should be washed in a solution of baking soda and water, rinsed in clean water, and dried with a piece of clean linen.

Replating Worn Spots

It is sometimes necessary to plate worn spots on an article so large that it would be a quite expensive item to replate the whole surface. A quick and satisfactory method of plating such worn areas is to fasten the cathode wire to the article to be plated, and the anode wire to a piece of sponge, about 2 in. in diameter. The sponge is dipped into the plating solution, the current turned on, and the metallic deposit is painted on the worn spots by passing the sponge over them. If a slight ridge is created on the line of the old and new deposits, a good burnisher should be used to work down the irregularity.

Fence Made from Discarded Porch Railing

A few years ago architectural styles demanded the addition of railings wherever they could be tacked onto a frame house. Besides being of questionable decorative value, the railings added to the cost of painting. The illustration shows a railing which was removed from a suburban residence and used to make a fence around the yard. The square posts, being hollow, were slipped over stout stakes driven into the ground, holding the whole structure erect. Before driving, the stakes were given a coat of asphaltum paint, to serve as a preservative.—Walter C. Harris, Brooklyn, N. Y.



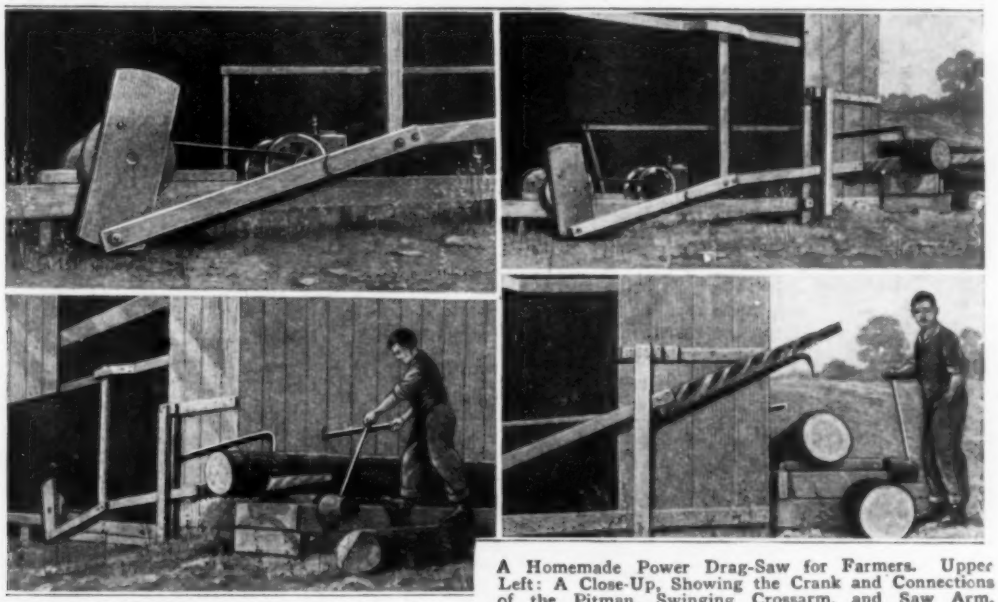
The Owner of a Suburban Home Removed the "Ornamental" Railing Which Style Demanded When the House was Built, and Used It to Make a Neat Fence

A Handy Drag-Saw for the Farm

By A. R. FERGUSON

MANY farmers still use the old hand methods of cutting up cordwood for storage, in spite of the fact that there are engines on their farms that can be harnessed to the work, with a very considerable saving in time.

In cases where the wood to be cut into stove lengths is too large for sawing on an ordinary buzz saw, the type shown in the drawing can be built on the side or end of the woodshed in a few hours, at practically no expense, as the materials required are usually at hand. All that is necessary for such a saw is a drag-saw blade, a piece of shafting about 5 ft. long, two pillow blocks, a pulley and flange to fit the shaft, two pieces of 2 by 8-in. plank, each 20 ft. long, and some short lengths of 2 by 6, 2 by 10, and 2 by 4-in. lumber. If the shafting and pillow blocks are not already at hand, it is possible that their cost can be saved by borrowing them from some of the farm machines, which, as a rule, are in storage when wood is being cut.



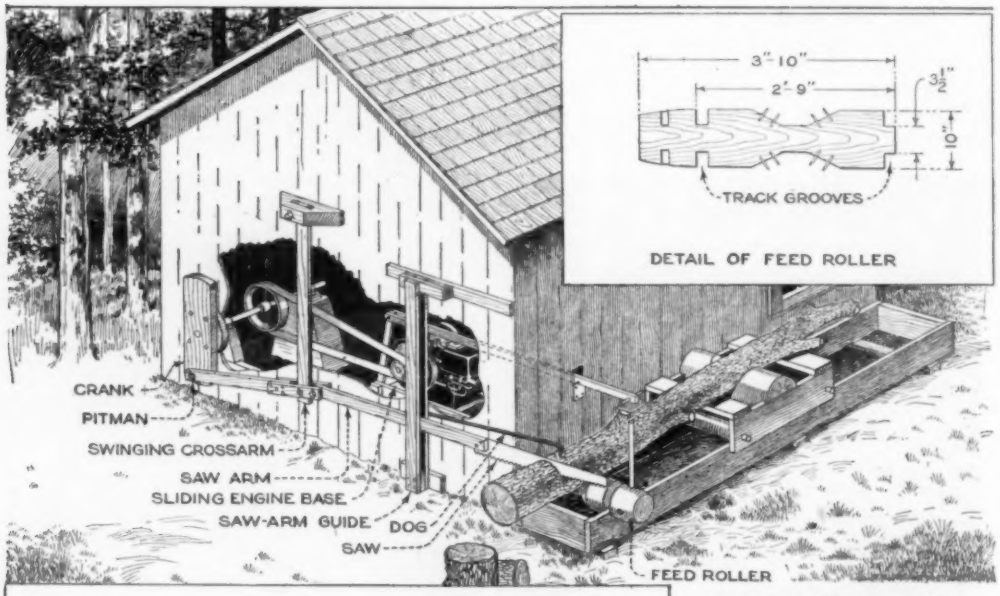
A Homemade Power Drag-Saw for Farmers. Upper Left: A Close-Up, Showing the Crank and Connections of the Pitman, Swinging Crossarm, and Saw Arm. Right: General View of the Outfit. Lower Left: Dog and Saw in Position, the Saw Being Nearly through the Log. Right: The Saw and Dog Lifted at the Completion of a Cut

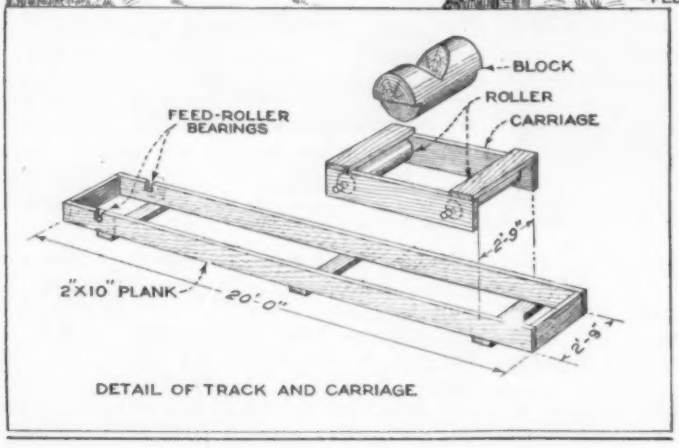
A common one-man saw blade may be used in place of the drag-saw, and when a small engine is used, is preferable. However, the light saw must be run slower, and given a lighter feed, or it may buckle, particularly if green wood is being cut. The machine itself has so few parts, and so few sources of friction, that the smallest type of farm engine can be successfully used to drive it.

The piece of shafting referred to and its pulley are mounted on the pillow blocks, as shown in the drawing, so that the engine can be connected to it. One end of the shaft projects beyond the side of the building, and a second pulley, or a flange, keyed to the shaft at this end, will simplify the attachment of the wooden crank, which is bolted to the shaft; this arrangement makes it unnecessary to provide a steel crank.

The crank is made from a short length of 2 by 10-in. plank, fastened to the pulley or flange on the outer end of the shaft with bolts. A bolt is used for the crankpin. The distance of the crankpin from the center of the shaft will determine the length of the saw stroke. For engines of 2 hp. or more, the proper stroke will be about 34 in., which means that the bolt used for the crankpin should be located 17 in. from the center of the shaft. Small holes are drilled through the bolt that serves as a crankpin; these are for cotter pins; if locknuts are used on the pin, these cotters are unnecessary. Steel washers should be placed on each side of the pitman on the crankpin, and between all other moving wooden parts, so that the friction of wood against wood will be reduced. The end of the pitman

farthest from the crank is supported by a swinging crossarm, as shown in the drawing. The upper end of this arm swings on a bolt in a slotted wooden bracket, fastened to the side of the building, and the lower end on a bolt in a wooden clevis, screwed to the end of the pitman. The open end of the clevis receives the end of the saw arm, which should be long enough to clear the corner of the building. Sidewise movement of the saw arm and saw is prevented by a guide placed about 3 ft. back of the corner of the





With This Machine, a Farmer can Cut the Product of His Woodlot into Stove-Wood Lengths at the Rate of from 5 to 25 Cords a Day

building; this guide should be long enough to allow the saw to be raised clear above the largest logs to be cut. Also, the guide should be so arranged that, when the cut is completed, it will prevent the saw from dropping onto the ground. A catch can be provided for holding the saw arm in its elevated position, when a new log is being placed on the carriage, or when it is fed forward for another cut. The saw arm should just move freely inside the guide, while the swinging crossarm should not be less than 6 ft. long and the pitman about 5 ft. The sides of the clevis extend past the swinging crossarm far enough to take the saw arm; this arrangement gives the slight rocking motion to the saw which is essential in the sawing of large logs. This movement, on factory-made rigs, is obtained by placing an eccentric on the driveshaft. The advantage of this is that, on the forward stroke, the saw cuts on the front side of the log, and on the back side on the back stroke. The driveshaft must revolve from left to right, or counterclockwise, else the sawdust will be pulled to the center of the saw cut or kerf, instead of being thrown out at the sides. Both the saw arm and pitman must be in a straight line and parallel with the side

of the building, and the shafting must be level and at right angles to the pitman and saw arm.

If the engine is a small one, a 3-hp. or less, it can be placed on a sliding base in the manner suggested in the drawing, so that by moving it backward or forward the belt will be tightened or loosened for controlling the operation of the saw. The sawyer is thus able to start and stop his saw by means of a lever extending through the side of the building and located near his post; the lever is pulled out to start the saw, and pushed in to stop it. A notch cut out of the underside of the lever forms a catch to prevent movement of the engine while the saw is running. If the engine is too large to be moved readily by this means, an ordinary belt tightener can be used, unless a countershaft with a tight and loose pulley is available.

The carriage track is made 3 ft. wide and 20 ft. long, 2 by 8-in. material being used for the sides and ends, the other crosspieces being made from 2 by 6-in. plank. The end of the track is placed even with the end of the building; the track should be exactly at right angles to the saw, and must be level and solid. The feed roller is made from a piece of log, about 10 in. in diameter by 3 ft. 10 in. long. Its journals, or track grooves, are 3½ in. in diameter, and just wide enough to turn freely in the notches provided in the forward end of the track. The spikes are made of ⅜-in. steel sharpened on each end and driven into holes drilled about 3 in. deep, after which they are hammered for another inch into the solid wood, to hold them firmly. Four large holes are drilled opposite each other in the outer end of the roller for the insertion of the bar that feeds the log forward.

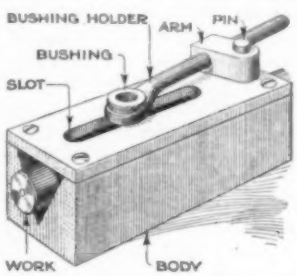
The log carriage is made as shown in the drawing, with the centerpiece saddled down to match the height of the feed roller, and prevent the log from moving sidewise; a few spikes set into the sides of the notch will prevent the log from slipping off as the feed roll is being turned. While the weight of large logs will be sufficient to prevent them from rolling, the smaller ones must be held by a dog. The latter is made from a piece of flat iron, the end of which is bent at right angles and sharpened, so that it can be driven into the log; this part of the equipment is bolted to the side of the building so that it can be swung up and down as desired. It should be heavy enough to stand a good blow.

Putting Rubber Sleeving on Wire

In electrical work, it is sometimes either necessary or desirable to slip rubber tubing over wire, in addition to the regular insulation, to make sure that there will be no short circuits. To get the sleeving on is rather difficult, as the insulation will slide along with the tubing unless the latter is oversize. One method of simplifying the work consists in waxing the insulation and heating the tubing slightly; another is to soak the tubing for a while in water, which causes it to swell enough to slip on easily. When dry, the sleeving will contract to its original size.—Frank Jablecnik, Chicago, Ill.

Self-Locking Drill Bushing for Slot Jig

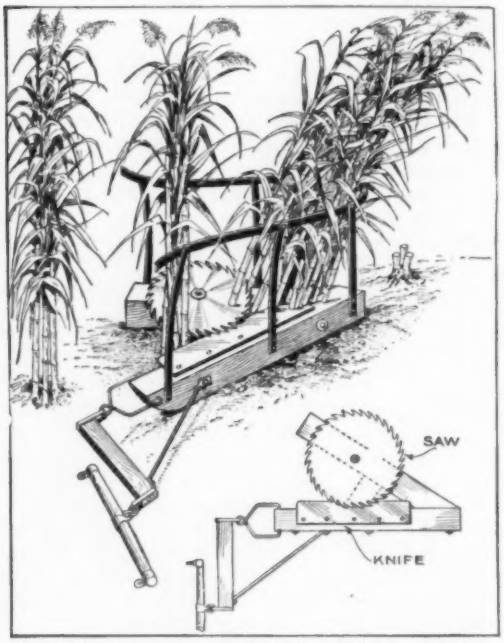
In all cases where holes are drilled with their edges close to each other, the novel method of locking a drill bushing shown in the drawing will be found of great assistance. It is shown applied to a box jig used to drill the cores of boring-bar slots, but, of course, can be used in any work of a similar character. A slot is cut in the top plate of the jig, wide enough to take the drill bushing snugly. In line with this slot a pin is driven in the plate; this carries a square steel arm, which in turn, carries the bushing holder, the latter being a piece of drill rod flattened at one end and drilled for the bushing.



It will be seen that, when the bushing is in the slot, it is impossible to move it backward or forward. When it is desired to change the location of the bushing, the holder is lifted, bringing the bushing out of its slot; the arm slides up the pin at the same time. The bushing holder is then pushed farther in or out of the arm, as required, and pushed down again until the bushing enters the slot. Holes can be drilled very closely together in this manner without danger of breaking through, or, if it is desired that they break into each other, no fear need be entertained that the drill will break.—Harry Moore, Montreal, Can.

A Simple Corn Harvester

The contrivance shown in the drawing was devised to supplant the slow and



A Simple Corn-Harvesting Machine, Built by a Farmer to Overcome the Tediousness of Cutting the Corn by Hand

tedious method of cutting corn by hand. A stout wedge-shaped timber frame was made, as indicated. A piece of flat steel was sharpened along one edge to form a knife, and this was bolted to the top side of one part of the frame in such a manner that about 1½ in. projected over the edge of the timber. On the opposite side of the frame an old circular saw was mounted so that it overlapped the knife for an inch or so. Discarded wagon tires were used for making the carrier, which is bolted to the frame, as shown.

In operation, a horse hitched to the device walks just outside the row, causing the cornstalks to strike against the teeth of the saw. As the stalks are carried between the saw and knife, the former revolves and cuts off the stalk, which falls into the carrier. When the carrier is filled, the stalks are removed, ready to be tied and shocked. On account of the unprotected knife arrangement, the operation of such a machine should not be entrusted to a youngster, who might become careless.

¶A tire pump can be used for blowing lamp burners.

Quick Method of Making Blueprints

In small shops, and other places where the facilities for making blueprints are lacking, the following method can be used to produce satisfactory results: Instead of making the original drawing on tracing cloth, use a piece of paraffined tissue paper which is backed up with a piece of new carbon paper. The waxed paper is placed over the carbon, so that pencil marks on it will be intensified by the carbon reproduction on the underside. The sketch is made in pencil, and the lettering can be printed in on a typewriter, still using the carbon. When finished, a print can be made from either the sketch intensified by the carbon backing, or from the carbon sheet itself. Blueprints made from the sketch will show white lines on a blue background, while prints made from the carbon copy will have a blue line on a white ground.

Coppering Brass for Laying Out

Copperplating brass with a solution of copper sulphate (blue vitriol or bluestone) and water is not so easily done as on steel. To enable the mechanic to lay out or scribe the work so that the lines can be easily seen, scatter a light coating of steel chips over the surface to be plated, and then apply the liquid. By using this method, brass can be given a thin coating of copper as easily as steel.

Table for Computing English Exchange

The usual printed tables for computing the exchange rate of English currency can hardly be used where the rates fluctuate

POUNDS		SHILLINGS		PENCE	
1	$ 1.00	1	$ .05	1	$.004166
2	2.00	2	.10	2	.008332
3	3.00	3	.15	3	.012498
4	4.00	4	.20	4	.016664
5	5.00	5	.25	5	.020830
6	6.00	6	.30	6	.024996
7	7.00	7	.35	7	.029162
8	8.00	8	.40	8	.033328
9	9.00	9	.45	9	.037494
10	10.00	10	.50	10	.041660
		11	.55	11	.045826
		12	.60	12	.049992
		13	.65		
		14	.70		
		15	.75		
		16	.80		
		17	.85		
		18	.90		
		19	.95		
		20	1.00		

Useful Table for Quickly and Accurately Converting Pounds, Shillings, and Pence, Quoted at Any Rate of Exchange, into Its Equivalent Value in Currency of the United States

as they have done at periods during and since the World War. The table shown herewith is good for all exchange rates, and is used as follows:

Supposing it is desired to convert £16 3s. 4d. into its equivalent in currency of

the United States, and assuming that the rate of exchange is $3.62 per pound sterling, add the totals of the following, which have been obtained by reference to the table:

£ 16	$16.00
3s.	.15
4d.	.016664
	$16.166664

Multiply the sum obtained above by the exchange rate per pound sterling, or $3.62, the result of which is $58.52332368 or $58.52 in currency of the United States. Any other exchange rate is used in the same manner.

A Ratchetless Windlass

A windlass or hoist that is specially handy around the farm is very simply made by mounting a wooden roller or pulley as shown in the illustration. The wooden roller, shown in Fig. 1, is bored along the axis, an iron rod of the proper diameter driven into the hole and bent to the shape indicated, to form the axle and crank; this rod is journaled in two posts, and the crank should be long enough to furnish the proper leverage. A hole, through which the rope is threaded, is bored through the roller as indicated. The rope cannot unwind from the roller when the latter is on the bottom center. It is true that this arrangement has a considerable up-and-down movement, but the usual ratchet is eliminated, a factor of importance when a winch must be improvised from materials at hand. The same principle is applied to the design shown in Fig. 2, in which a small pulley is used. By the use of additional pulleys, as in Fig. 3, the windlass can be arranged to pull a load in any direction, or from any reasonable distance.—W. G. Partin, La Grange, Ga.

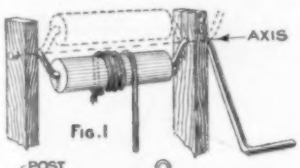


Fig. 1

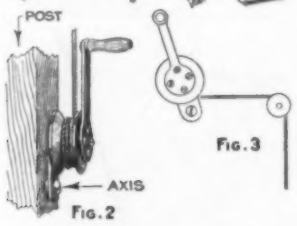


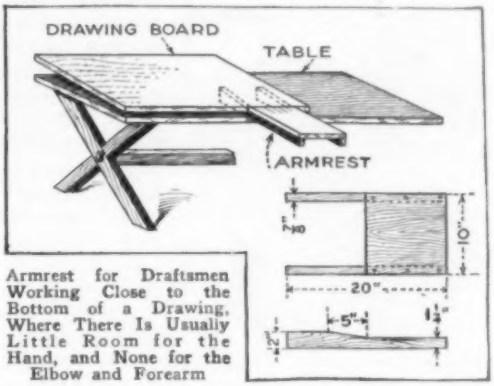
Fig. 2

Fig. 3

Do not tamp cinder concrete too much, as the cinders will crush and the surface to be covered by the cement will be increased considerably.

Armrest for Draftsmen

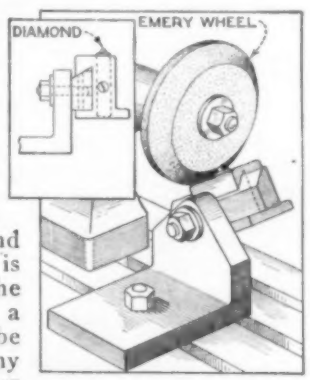
In cases where the draftsman must do a lot of lettering or fine detail work near the bottom of his drawing, there is not, as a rule, enough space on the board for placing the hand, and no support at all for the arm. The armrest illustrated was designed to overcome conditions of this kind. The construction of the rest is amply described by the drawing, and, in use, the projecting ends of the side members are placed underneath the lower edge of the drawing board as shown.



Armrest for Draftsmen Working Close to the Bottom of a Drawing, Where There Is Usually Little Room for the Hand, and None for the Elbow and Forearm

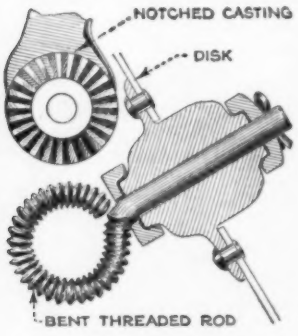
Fixture for Dressing Angular Grinding Wheels

When grinding straight-type formed cutters, it is sometimes necessary to dress the wheel to the exact angle, frequently a difficult thing to do. The drawing shows a fixture for dressing the grinding wheel that can be used to produce accurate results. A hardened and ground slide is attached to the angle plate by a stud; this can be adjusted to any angle by setting with a protractor from the base. The diamond-tool holder fits on this slide, and is moved back and forth on it to dress the wheel. The fixture may either be clamped to the table of the grinding machine or held on the magnetic chuck. The diamond holder is held in place by a setscrew, as shown in the insert.



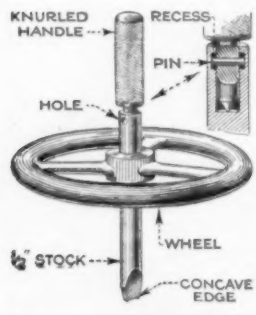
Emergency Shank for Farm Implements

On farming implements using disk wheels, the shanks holding them are often broken, or so badly worn that they cannot be used. New shanks are easily made in the farm workshop, but the teeth for holding the adjustable shank tightly against the notched casting are difficult to form with the file or chisel generally used. An easier method is to use a threading die that will cut threads corresponding as accurately as possible to the notches in the casting, and thread the end of the shank before the eye is formed. Although the threads may not coincide exactly with the notches in the casting, the parts can be bolted together tightly enough to hold.



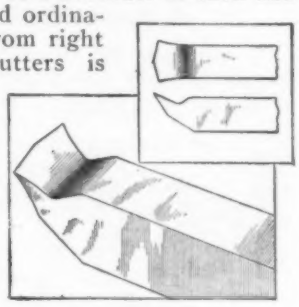
Screwdriver for Rapid Work

The novel screwdriver shown will be found a handy tool, in cases where a large number of screws are to be turned down, as in assembling operations of different kinds. Starting the screws by hand, as usual, they can be quickly spun into place and tightened. The blade is made of ½-in. stock, and is ground with a concave edge. The upper end of the stock is drilled out and flat-bottomed, leaving a small center only. Next, a recess is cut near the end, and a small hole is drilled through its center, as shown. Another piece of ½-in. stock is used for the handle, one end of which is turned down to fit loosely into the hole in the blade section. The small end of the handle is turned to a taper point, which runs in the center provided. A pin, a little shorter than the diameter of the recess, is driven into the handle and prevents the parts from becoming separated. An old valve wheel, or any wheel of suitable diameter, is then driven tightly onto the driver section of the tool, and, if necessary, further secured by a pin. With the screws all started in one or two threads, the screwdriver is placed on each in turn, a slight downward pressure being applied on the handle; this, together with the concave edge, holds the tool in place while the wheel is given a quick twirl which sends the screw home rapidly. A slight pull on the wheel seats the screw tightly.



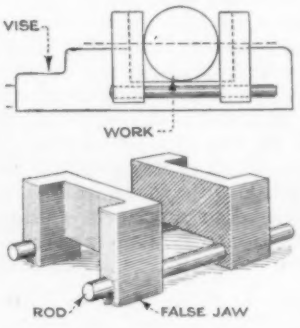
Double-Faced Finishing Tool

Many turning operations demand that the cut be taken to a shoulder at each end of the work, and ordinarily a change from right to left-hand cutters is necessary, which, unless some form of a turret tool holder is used, requires a separate operation or else a delay while the operator changes from one tool to another. In order to speed up work of this character, the tool illustrated can be used. As will be observed, the tool is made with a clearance and slight bevel from the center, thus adapting it for either right or left-hand cuts without change.—John Harger, Kaimuki, Honolulu, T. H.



Removable Jaws for Machine Vises

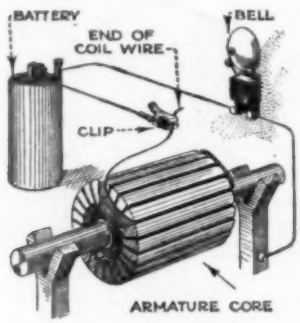
The narrow depth of milling-machine vises requires the use of some kind of false jaws when it is necessary to hold work with a bearing point above the fixed jaws; a shaft of such a diameter that the center is higher than the top of the vise jaws is a familiar example. Removing the regular jaws and attaching false jaws by means of screws and dowels, may take more time than the job warrants, but the removable jaws illustrated can be slipped into place



or out again in a second or two. Two pieces of flat stock are shaped as illustrated, to fit the vise, and cut away in the center to allow the sides to hang down against the sides of the vise. Two tool-steel rods are then driven tightly into holes drilled in one of the jaws, the holes in the other jaw being large enough to allow it to slide on the rod guides. The jaws provide a good bearing for the guide rods and are held in line by them when the vise is tightened on the work.

Testing for Electrical Grounds during Winding Operations

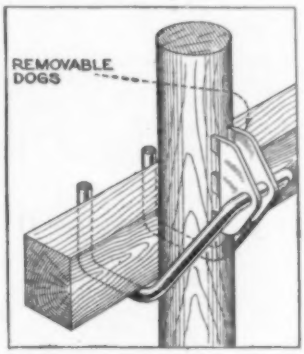
Even the most skilled armature or field-coil winder often finds, on completing his work, that the final electrical test indicates a ground. Should this ground be at the bottom of a slot, where it is difficult to repair, it may be necessary to rewind the entire job. It is quite possible to save this time and expense by testing for grounds during the winding. As will be noted, the iron of the core or field, as the case may be, is connected electrically through a bell or low-voltage lamp to one terminal of a battery. A flexible lead, with a snap clamp attached, runs from the other battery terminal. When a coil is about to be placed in position, the clamp is clipped to the end of one of the coil wires. By this method, if a ground is made at any time while the coil wires are being placed in the slots, the bell will ring or the lamp light. After one coil has been placed in position, the clamp is fastened to the second coil, and so on, until the job is finished. If it is not convenient or possible to use a snap clamp of the type shown, it is suggested that the battery wire be fastened to the pliers; then, when the wires are being connected or pulled into place, the grounds will be indicated as they are made.



¶A four-per-cent solution of soda and water will lighten overexposed blueprints, or will bleach them nearly white if desired; add more soda to bleach completely.

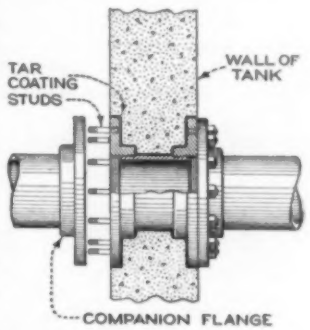
Handy Type of Scaffold Dogs

The dogs shown in the illustration will prove of value when erecting a scaffold for painters and carpenters, and for other purposes, as they eliminate the necessity of nailing the timbers together, and yet provide perfectly secure structure. The supporting arms are made of iron rod, bent to fit the 2 by 4-in. material commonly used for scaffolding. The toothed dogs are forged from steel, and bite into the uprights as soon as weight is applied. These dogs can be used with either round or square timbers. — Henry S. Laraby, New Haven, Conn.



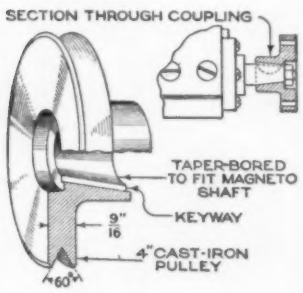
Water-Tight Pipe Connection for Concrete Tank

For some time, the making of pipe connections in the walls of concrete tanks has proved a troublesome problem, especially if the connection is to be made below water level, where it must be tight. The drawing shows a simple method of making a water-tight joint that can be easily disconnected. Make up a short nipple, with both ends threaded, so that the flanges can be screwed up to be flush with the inner and outer surfaces of the tank. The flanges are equipped with studs, and the flanges and nipple should be coated with tar before assembling. It should be understood that a sleeve of the same diameter as the outside diameter of the nipple used should be placed in the form before the concrete is poured. After the concrete has set, and the nipple and flanges have been screwed in place, companion flanges are bolted in place.



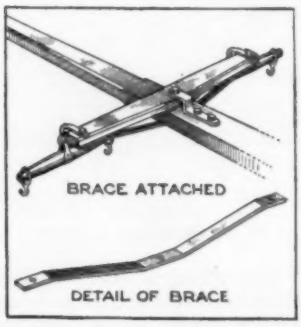
Driving Pulleys for Magneto Testing

Magnetos are driven from the timing gears of an automobile engine through a coupling, and, when testing the magneto after being repaired, it is usually found unsatisfactory to drive it by running a belt over this coupling. Many repairmen try to use makeshift devices when testing, but the only fitting by which satisfaction can be obtained is a V-groove pulley, the bore of which is tapered, and having a keyway to suit the Woodruff key in the shaft. These pulleys can be made of cast iron, and a set of four or five should be made up at one time. Machined all over, they will have perfect balance, this being necessary, as they must turn at high speed. As the spindles of various magnetos are different in taper as well as in size, one pulley should be made for each of the most commonly encountered types. Some of the older makes use a straight shaft, holding the coupling with a taper pin through shaft and coupling.



A Brace for Doubletrees

The tendency of a doubletree to wobble and teeter, with the tongue of the implement as a fulcrum, is always an annoyance, causing unnecessary rattle, and a hardship on the team. The brace illustrated overcomes the troubles mentioned, holding the doubletree steady and without interfering with its swiveling movement. A piece of old wagon tire is used for the brace, which is bent in the manner shown. Three holes are drilled in the brace, one at each end for the clevis pins of the doubletree to pass through, and one hole at the middle for the doubletree pin through the tongue.—G. H. Glitzke, Kansas City, Mo.

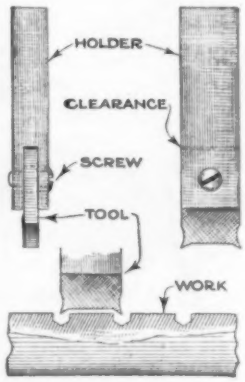


To Color Aluminum Black

A solution for coloring aluminum black is made up as follows: Dissolve 1 oz. white arsenic (poison) and 1 oz. sulphate of iron in 12 oz. hydrochloric acid, and add 12 oz. of water. The aluminum to be blackened is well cleaned with fine emery cloth and washed, before immersing it in the blackening solution. It is allowed to remain in this until the color is deep enough, when it is removed, washed in clean water, and dried in fine sawdust, after which a coat of lacquer is applied.

Cutting Keyseats in the Shaper

When no milling machine is available, the work of cutting a round-ended keyseat is awkward. Drilling a hole at each end of the keyway and cutting out the intervening metal on the shaper is the method generally adopted, but as only a very slender tool can be used, breakage is naturally frequent. If the number of keyseats will warrant, the tool and holder shown will be well worth the time spent making them. The holder is simply a piece of rectangular stock, slotted at one end, and drilled and tapped for a long-head screw. The tool is as thick as the width of the keyseat to be cut and as wide as the holder, as will be explained. When assembled, there should be a small clearance at the top between tool and holder, to allow the tool to rock. The keyseats are drilled at the ends in the ordinary way, and a hole is drilled in the middle, the length of the tool being equal to the center-to-center distance of the holes. In operation, the holder is gripped in the toolpost and the clapper box blocked up. The shaper is set to a stroke slightly longer than the length of the tool, which cuts away from the center hole on both forward and backward strokes, the clearance between the top of the tool and bottom of the slot allowing the noncutting end to clear the work. It will be seen that a substantial tool can be used by this method, and that the time required to cut the keyseats is reduced to almost half that required for the older method.



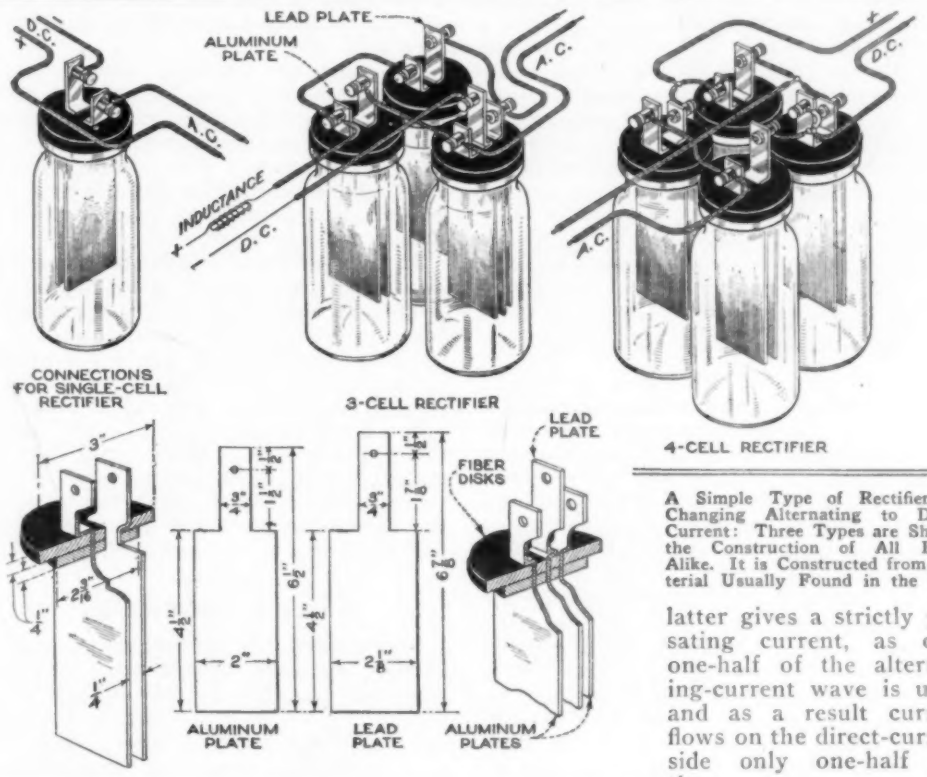
Making Electrolytic Rectifiers

By CHAS. E. MULLIN

MOST experimenters feel the lack of direct current for recharging small storage batteries, such as are now widely used with radio apparatus; and for running small direct-current motors, electroplating, and such other purposes for which alternating current cannot be used. The residence zones of nearly all cities are, with but few exceptions, served only with alternating current. It is a very simple matter to transform the alternating-current voltage to almost any other voltage, up or down, by using suitable transformers, but this does not change the character of the current. Rectification of alternating current into direct current is an entirely different matter, and is accomplished by various forms of rectifiers, or by a motor generator, all of which are rather expensive.

For the ordinary requirements of the small-shop man, experimenter, or radio-set owner, a three or four-cell electrolytic rectifier provides the cheapest and most satisfactory method of rectifying the alternating current. Such a rectifier is not all that might be desired from the standpoint of efficiency, but the power demand for experimental work is not usually very heavy, and therefore the technical efficiency becomes of minor importance when compared with considerations of low cost and convenience.

The rectifier here described utilizes both sides of the alternating-current wave, which makes it just twice as efficient as the single-cell type sometimes used. The latter gives a strictly pulsating current, as only one-half of the alternating-current wave is used, and as a result current flows on the direct-current side only one-half the time.



A Simple Type of Rectifier for Changing Alternating to Direct Current: Three Types are Shown, the Construction of All Being Alike. It is Constructed from Material Usually Found in the Shop

The three and four-cell rectifiers utilize both sides of the alternating-current wave, and, while the direct current from this type of rectifier is also pulsating in character, current is flowing through the output side practically all the time, and these pulsations may be greatly damped or smoothed by means of an inductance, as will be described later on.

Direct current produced by rectification cannot be used in place of a storage battery for radio receiving on account of its pulsating character, but may be used for recharging the storage battery if it is of small size.

Either the single or multiple-cell type

electrolytic rectifier may be readily constructed from materials usually at hand in the shop or laboratory, or which can be easily bought at very small cost. From my own experience I prefer the three-cell type of rectifier, but the four-cell combination gives a direct current that is slightly steadier. The instructions given apply to the construction of the three-cell type for use on 110-volt alternating circuits, but they may be readily adapted to either the single or four-cell rectifiers. This rectifier will give as much as 5 amperes for very short periods, but heats up under continuous service at even much lighter loads. However, by increasing the surface area of the plates, using larger jars, or by water-cooling the outside of the jars, the current capacity of the rectifier may be increased as desired.

For the three-cell rectifier the following materials will be required:

2 pieces of sheet lead, 6½ by 2 by 1/16 in.
1 piece of sheet lead, 6⅛ by 2⅛ by 1/16 in.
4 pieces pure sheet aluminum, 6½ by 2 by 1/16 in.
3 pint fruit jars.
Bakelite or fiber board, about ⅛ or 3/16-in. thick, sufficient to make three disks, 2 3/16 in. in diameter, and three, 3 in. in diameter.

A good grade of sheet iron, or carbon rods or plates, may be substituted for the lead plates. The four aluminum and two of the lead sheets are cut into plates of the same shape and dimensions as indicated by the detail drawing marked "aluminum plate." The larger lead plate is formed to the measurements shown in the other plate-detail drawing. Three disks are cut to fit neatly inside the mouth of the jars, and three larger ones are provided to form covers. Ordinary wood may be used instead of the bakelite or fiber board, but it must first be boiled in paraffin, to prevent warping, and to increase its dielectric properties. One each of the large and small disks are fastened together to form single covers, and slots, about ¼ in. apart, are cut in them; these slots should be just large enough to make a tight fit on the plate lugs. Two of the cells are arranged with one lead and one aluminum plate in each, while the third cell has two aluminum plates, one on each side of the larger lead plate. The plate lugs are offset slightly, as shown in the drawing, in order to hold them securely in place. If desired, holes can be drilled through the plate lugs and the lugs fitted with binding screws or posts to facilitate connecting.

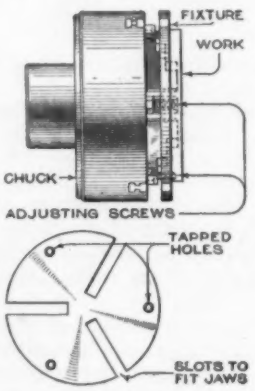
The mouths of the jars should be dipped into melted paraffin for about ½ in.; this will prevent the electrolyte solution from "creeping." The jars are then filled to within about ½ in. of the top with a 5 or 10-per-cent solution of sodium bicarbonate (ordinary baking soda). The covers are then placed on the jars with the plates extending down into the electrolyte. Make certain that no two of the plates touch each other, and connect them as shown in the several drawings with No. 14 insulated copper wire. Suitable fuses and a switch should be provided on the alternating-current side, between the line and the rectifier, as a protection against accident. This switch should always be open when the rectifier is not in use.

To start the rectifier, switch on the alternating-current and close the direct-current circuit for a few minutes through about 100 ohms' resistance, such as a 100-watt lamp; this is only necessary when starting a new rectifier for the first time, but must be done in all cases, or else the device will not work.

In case a smoother current wave is desired than that furnished by the rectifier alone, an inductance may be introduced into the circuit in the manner shown. A suitable inductance is made by winding 200 or more turns of No. 16, or larger, insulated copper wire around a 1 by 1 by 6-in. laminated-iron core. Of course these inductance specifications can be changed, and the larger the core and the more turns of wire upon it, the smoother the direct-current wave will be, but this will cut down the power available.

Chucking Narrow Work

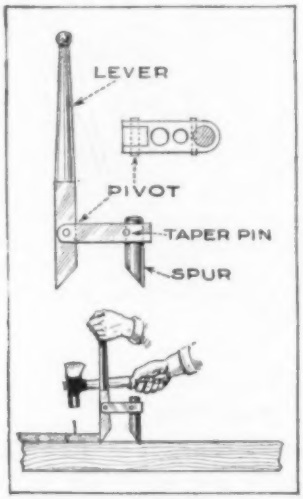
Every mechanic knows the necessity of backing up work against the chuck jaws whenever possible, as this enables heavy cuts to be safely taken and also greatly facilitates the setting up of the job. A handy fixture that can be instantly attached or detached to a three-jawed chuck is shown in the drawing; it is designed to be used when facing rings, flanges, or covers that are too thin to be backed up against the step of the chuck jaws and still allow the surface to be



clear. The supporting piece is made from stock about the same diameter as the chuck, and thick enough to insure strength for the size of chuck used. Three slots are milled in this piece, 120° apart, and wide enough to form a sliding fit over the chuck jaws. Three holes are tapped in this piece, to take a corresponding number of hexagon-headed screws. When a number of pieces require to be faced, the fixture is slipped over the jaws, and the screws are adjusted until the piece is held in the proper position and is running true. The work is then held back on the fixture with one hand while the jaws are tightened. Very thin work can be securely held in this way, supported as it is all the way around. Furthermore, no time is wasted in tapping the work true, always an annoying operation on thin work and, if the job is a light casting, the danger of breakage is avoided.

Flooring Clamp

Flooring clamps of some sort are a necessary part of the carpenter's equipment for laying floorboards, unless he clings to the primitive method of nailing a piece of 2-by-4 stuff to the joist and wedging the warped stock against the rest of the floor.

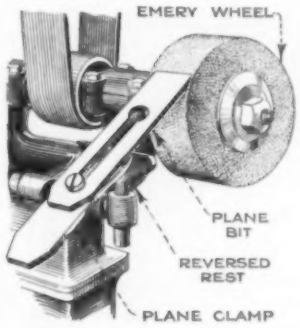


The lever part of the clamp shown is made of 1-in. square steel, and the connecting link is made from a piece of ¾ by 1¾-in. flat stock; it is slotted at the front, for the lever, and drilled at the rear, for the spur. The spur is a piece of ¾-in. round tool steel, beveled at its lower end. A taper pin is used to hold the spur and link together. One or two holes can be drilled in the link in order to lighten it.

In use, the tool is brought up against the board, and the spur is driven into the joist with a blow of the flooring hatchet or hammer; this being done, pressure is exerted on the lever to bring the board into position for nailing.

Grinding Plane Bits

A practical way of grinding a plane bit at the proper angle is to reverse the plane clamp on the back of the bit and then reverse the grinder tool rest, which will serve as a guide. By placing the edge of the clamp against the straight edge of the rest, and lowering the edge of the bit against the face of the grinding wheel, the proper bevel will be found. Then tighten down the clamp screw, and, by sliding the bit and clamp back and forth across the face of the wheel, a good, straight edge and hollow grind will be obtained. It goes without saying, that the face of the wheel should be perfectly true.—Glen W. Noble, Jesup, Ia.



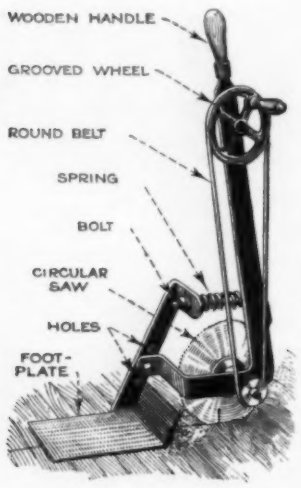
Method of Mounting Window Sash

In doing some work where it was impracticable either to slide a window sash upward or sidewise, or to hinge it at the top and swing it to the ceiling, the arrangement illustrated was found very satisfactory. The window was hinged to two short iron straps as shown. When the window is closed these straps fit into a mortise cut into the edge of the sash. Wooden dowels, driven into the edges of the sash a short distance above the hinges, fit into the grooves on the sides of the window casing. Notches, cut in one side of the grooves as shown, allow the window to be held open at several angles.—Rufus E. Deering, Ottawa, Kan.

¶When cutters do not run true, when the work springs, or when the arbor of the milling machine is too light, wavy lines will show on the surface of the work.

Flooring Saw for Wiremen

An electrical contractor, making a specialty of wiring old houses, devised the saw shown in the drawing for cutting neat openings in the flooring. It was found that this saw saved a great deal of time and labor, and made a much neater cut than could be obtained by any other method.



A small circular saw was fastened to a 3/8 by 1¼-in. flat iron bar, bent to the shape shown and provided with a handle. A handwheel, with a groove for the round leather belt used, was fastened to the upper part of the bar, and a smaller grooved pulley was fixed to the arbor on which the saw was fastened. This arbor was made from a bolt, and was supported and held rigid by a long bushing, forced into a hole in the supporting bar. A lug was welded at right angles to the upright bar. A similar lug was provided on the member to which the footplate was fastened, and a bolt and spring connected the two lugs. The spring was open-wound, to give it resistance to compression or expansion, as the pressure on the handle demanded. The bar to which the footplate was fastened was made of the same material as the longer one, and several holes were drilled in it for the purpose of raising or lowering the saw when cutting flooring of different thickness.

Yellow Stain in Hardwood

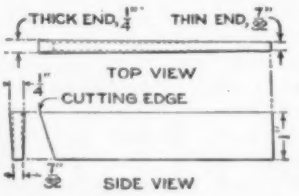
A troublesome defect often found in hardwood lumber is that known as yellow stain. It is usually distinguished by a pale-yellow color, generally occurs in streaks, and is detected most easily when the wood is surfaced, although it is present at times without discoloration of the wood. Its first symptom may be a moldy appearance of the wood.

The only damage yellow stain is positively known to do, is to mar the finish of the product, since it usually penetrates the wood so deeply that it cannot be surfaced off. It is probable, however, that the fungus actually weakens the wood, and the use of yellow-stained lumber for airplane construction and similar purposes where strength is important, is to be discouraged, until a more definite knowledge is obtained about its action on wood structure.

Lumber can be protected from attack of the yellow-stain fungus by seasoning the stock without delay after it is cut, storing it in a dry place, or treating it with preservatives.

Improving Cutting-Off Tools

The only fault that can be found with ready-made cutting-off tool bits is that there is no taper to the blade, so that clearance is only obtained at the bottom. If a quantity of such bits are on hand in the tool room, they can be taper-ground, to the dimensions shown, on a common surface grinder. This grinding should be done on both sides of the tool, as it is a good idea to remove the oxidized surface of the hardened steel. Tools ground with a taper from front to back will, when set square with the job, cut without tendency to dig, and only require grinding on the front face to resharpen them. It is best to buy the ready-made kind and regrind, as the steel used by the makers is of the best and is properly hardened and treated.



Making Concrete Bases for Steel Posts

The increasing scarcity and cost of wooden fence posts are gradually forcing the steel post into general use. It is well known that steel posts, when set in concrete, will stand firmer and last longer, but the common system of digging the post hole first, setting the post, and then filling the hole with concrete, is a slow and tedious job. I have found the following method much better: Make tubes 6 in. in diameter and 20 in. long from building paper; strengthen the splice by driving a few tacks through the double thickness of paper into a piece of lath placed on the outside. Drive the tacks from inside the tube. Place these tubes

in rows on the ground, about a foot from the barn wall and slanting a little toward it. Then drop a little sand or loose dirt into each tube to prevent the concrete from running out at the bottom. Place the lower ends of the posts in the tubes, leaning the upper ends against the barn wall so that they will be approximately centered in the tubes, and fill the latter with concrete. The mixture should be in the proportion of 1 part of cement to 5 parts sand. After the tubes have been filled with the cement and sand mixture, they should be allowed to remain undisturbed until thoroughly dry. When ready for use, the posts and their concrete bases can be loaded onto a wagon and hauled to their destination.—Ed Henderson, Lake Mills, Ia.

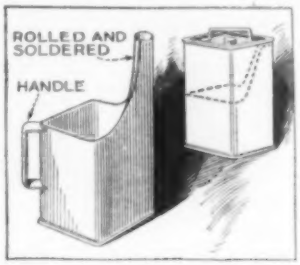
Strap Handle for Pounding Block

The common lead block, used in every shop for the purpose of pounding different materials without marking or marring, can be more conveniently handled if a leather or thick felt strap is attached in the manner shown in the illustration.

As a rule, no particular attention is paid to the shape of the block, weight being the only consideration, but it will be found that blocks molded in the end of a tube are both easy to make and handy to use. To attach the handle, a hole is drilled through the lead, near one end, to take a stud about ¼ in. in diameter. The strap is cut out in one piece, and one end is passed over the stud on one side, then brought over the top and over the stud on the opposite side, doubled and brought back to the first side again, leaving enough space between the parts of the strap to insert the hand easily. Then the nuts are screwed tightly. In this manner the bottom part of the strap forms a pad that lessens the shock of the blows, and the top piece enables the workman to lift the weight without gripping the sides all the time. The advantage of making the handle in one piece is that the top portion cannot fall out of an upright position.

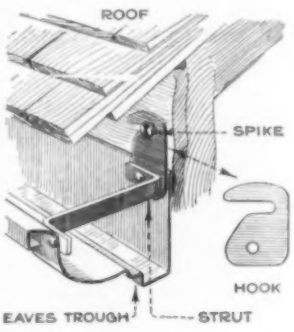
Filling Can for Auto Engines

The breather pipe through which oil is poured into the crankcase of automobile engines is usually so located that a funnel is required when the oil supply is to be replenished, if some of the lubricant is not to be spilled. A convenient filling can for this work can be easily made from an empty oil tin in the manner illustrated. The top and handle of the can are removed, and the sides are cut away as shown by the dotted lines, leaving a section in one corner; this is rolled over and soldered to form a spout. The handle is soldered to the opposite corner. If made from a 1-gal. can, the filler will have a capacity of about one-half gallon.



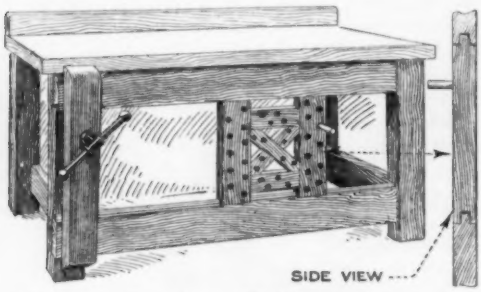
Eaves Trough Made Removable

Eaves troughs can be made so as to be easily removed from the house for painting and cleaning. A great many persons are under the impression that, because the material from which the eaves troughs are made is galvanized, it will last more or less indefinitely, with little or no painting. This is a wholly erroneous and expensive notion. Painting the troughs on the building is a laborious undertaking, and the work cannot be done as well from a ladder as it can on the ground. The drawing gives a clear idea of a hanger that makes it possible to remove the trough, and apply the paint thoroughly and comfortably. The hook is made of sheet iron, and is riveted between the Z-shaped brace and the side of the trough, so that it can be swung back. If a large quantity of such fasteners is to be made, a simple blanking die could be used. A short spike, or heavy screw, driven into the side of the building, is used for attaching the hook.



An Adjustable Rest for the Workbench

The manual-training department of a school uses the adjustable work rest shown in the drawing on the work-

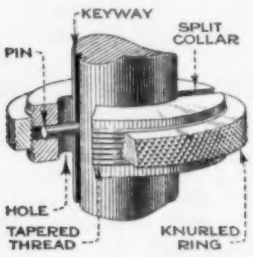


A Support or Rest for the Workbench That Accommodates Work of Any Width or Shape

benches. The rest is provided with a tongue and groove on its upper and lower edges, as shown at the right; these fit corresponding guides in the horizontal braces of the bench. The frame, or rest, is drilled with irregularly spaced holes so that work of any shape, held in the vise, can be supported by inserting pins in the proper holes. It will be noted that the groove is cut on the upper brace of the bench; this prevents its becoming choked with sawdust and other débris of the shop.—Irwin L. Morrow, Muncie, Ind.

Neat Drill-Press Stop Collar

For the smaller sizes of drill presses, the split stop collar shown in the drawing will be found much more convenient than the type commonly used, as no screwdriver or wrench is required to fasten it to the spindle. Furthermore, this stop collar presents a neater appearance and is less likely to catch the operator's clothes than the common type. It is made in two pieces, the split collar itself and a knurled ring that screws onto it. The collar is bored to make a close fit around the drill spindle, and a slightly tapering, fine-pitched thread is cut on the circumference. The thread is turned down on both ends, only the center portion being left, the width of this being slightly greater than the width of the knurled ring. A hole is drilled through the side of the collar for a pin that fits into the keyway of the drill-press spindle. To complete the stop, a hole is drilled through the collar, in line with the saw slot, to provide further spring, and the knurled ring is fitted. When slipped onto the spindle of the machine, the collar can be loosened or tightened in a second, the pin in the side preventing it from turning on the spindle while this is being done. Care should be taken to use a fine-pitch thread and turn down the ends to suit the narrow ring, as otherwise the collar will be difficult to adjust.

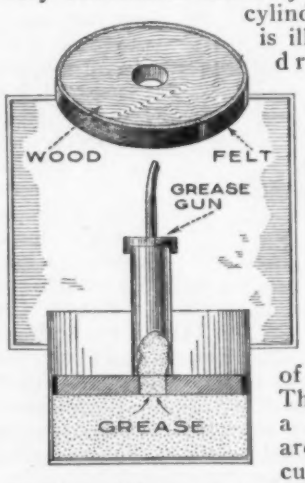


Magneto Magnets Used for Clamps

Old magnets from the magneto of a well-known light automobile, which are obtainable at garages and service stations, can be used to make serviceable clamps for bolting work down to machine tables. What magnetism there may be remaining in the parts can be removed by heating them to a bright red, and quenching in water.—J. H. Rouse, San Francisco, Calif.

Filling the Grease Gun

Filling the grease gun is a messy job, especially when one is in a hurry. A very convenient and easy way to fill the cylinder of the gun is illustrated in the drawing. Cut a disk of wood, slightly smaller in diameter than the inside of the grease can, and bore a hole through the center of the wood a trifle smaller than the end of the grease gun. Then glue or tack a strip of felt around the circumference of the wooden disk, so as to make a snug fit inside the can of grease. By placing the disk inside the can, with the end of the grease-gun cylinder over the hole in the center, and applying pressure, the lubricant will be forced upward through the hole into the barrel of the gun. The disk can be left in the can, until empty, to serve as a cover.—Rudolph H. Kasper, Philadelphia, Pa.



Amateur Mechanics
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

How to Build a "Pushboat"

By L. B. ROBBINS

MUCH fun can be had during the swimming season with a "pushboat" of the type illustrated, which operates on the same principle as a variety of popular small-wheeled vehicles.

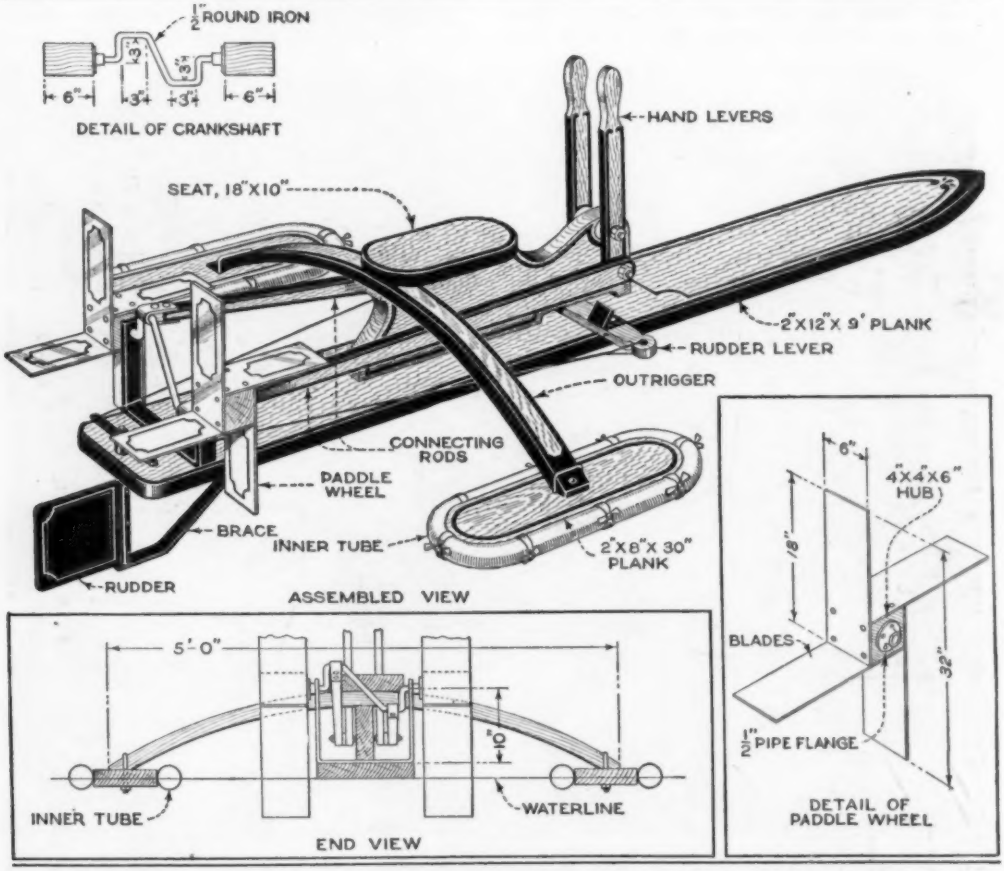
The hull—for lack of a better name—is made from a single thick plank, the bow end of which is pointed. After smoothing off the surface of the board, it is given at least two coats of good paint. A piece of 10-in. plank, 3 ft. long, is spiked to the deck and in the center of the hull, as shown. Then a seat, made from a 10 by 18-in. board, is nailed to the stern end of the upright. Round off the edges so that they will not cut the legs. A mortise is cut in the upper edge of the upright, under the stern end of the seat, to receive the outrigger, and a recess under the forward end, to clear the rudder lever. A curved piece of timber, 5 ft. long, is used for the outrigger, and two round-end planks are fastened to its ends, as in the drawing. These outboard planks should be slightly lower than the hull. The outrigger is then spiked to its mortise in the upright so that the planks will be at the same distance away from the

A Hand-Propelled Paddle-Wheel Water Craft of the Catamaran Type: The Back-and-Forth Movement of the Hand Levers Drives the Paddles through Connecting Rods and a Crankshaft. A Curved Outrigger is Provided with Wooden and Pneumatic Floats on Either Side

hull and parallel with it. The planks are given buoyancy by tying an inflated inner tube around the edge of each; these can be protected with a wrapping of canvas or burlap.

Movement, forward or backward, of the craft is given by paddle wheels, operated by a pair of levers mounted in front of the seat. The paddle wheels are made by screwing four sheet-metal blades to the sides of an oak hub, as indicated in the detail drawing. Two such paddle wheels are required, and they are attached to the ends of a crankshaft, as detailed, each end of the shaft being threaded to screw into the pipe flanges fastened to and screwed as tightly as possible, to prevent them from turning loose by the action of the wheels in motion.

Then bolt a pair of levers, about 30 in. long, one on each side of the bow end of the upright, in front of the seat. The pivot bolt goes through the top corner of the upright, and should be provided with washers. Form smooth handles at the top of the levers and drill holes about 6 in. below the pivot bolt, for the connecting-rod bolts. The levers must work back and forth freely. Motion from the levers is communicated to the paddle wheels by means of connecting rods, which are made of oak or ash. These



Detail Drawings of the "Pushboat" Which Clearly Show How the Craft is Assembled: Such a Boat Is Inexpensive to Build and can be Made Easily with Few Tools. The Outrigger Floats Make Capsizing or Sinking Difficult if Not Impossible, and It can be Driven at Good Speed in Quiet Waters

the paddle wheels. The crankshaft is supported on a U-shaped piece of heavy iron, the bearing holes being drilled 10 in. above the deck. In screwing the paddle wheels onto the crankshaft, the flange threads should be coated with white lead rods are loosely bolted to the levers in front, while the rear ends are round-notched and fitted with flat-iron bearing straps which fit around the crankshaft. By moving the levers back and forth, the paddle wheels are revolved.

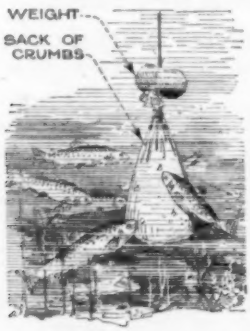
Any sort of rudder can be hung from the stern and fitted with a tiller as in the drawing, so that the hands are not required to guide the craft. After completion, the whole craft is given several coats of paint to protect it from the water.

With the operator aboard, the hull will be nearly submerged, but the two inner-tube floats at the ends of the outrigger will keep it afloat and steady so that there will be no possibility of its capsizing or sinking in smooth water.

Sit facing the bow, grasping a lever in each hand and the feet on the steering lever, and then commence to pump the hand levers back and forth, at the same time steadying the rudder.

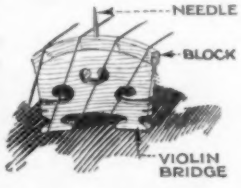
Crumbs as Lure for Fish

Fish can be attracted to the spot where the fisherman is casting, by partly filling a paper bag with bread crumbs and meat scraps, and suspending it in the water. An ordinary paper flour bag is used, and, after it has been filled, weighted, and a cord tied around the neck, it is lowered to within about 4 ft. of the bottom, at the spot selected. Two or three small holes are made in the sides of the bag and this will start a few crumbs falling, which will attract some fish. As the crumbs are seized upon by the fish, and other crumbs continue to fall, still more fish will be drawn to the spot. After a suitable interval has been allowed for the lure to become effective, the baited hook is let down. This method is superior to the common one of scattering loose crumbs on the water.



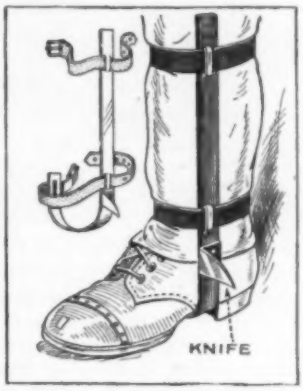
Violin as Phonograph Reproducer

Another of the multitude of experiments aimed at getting peculiar effects from a phonograph record, makes use of a violin as a sound box or reproducer. The bridge is fitted with a small wooden block, cut to conform to the curve; this block should be about ¼ in. square and the same length as the bridge. A phonograph needle is inserted through the center of this block, which is held tightly to the bridge by the strings. The record is played by holding the violin so that the needle rests lightly on the disk.—H. M. Flint, Strathmore, Calif.



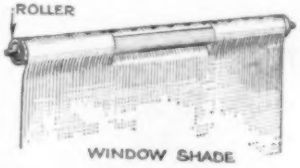
A Novel Corn Cutter

The corn harvester can work faster and with less fatigue when the corn cutter shown in the drawing is used, as both hands are left free to handle the stalks. The cutter has the general appearance of a lineman's climber, although worn in a different manner. The leg iron is made from a piece of flat steel or iron, provided with loops for straps. The steel cutter is riveted to the leg iron and sharpened on the edge toward the heel.—T. S. Stuart, Indianapolis, Ind.



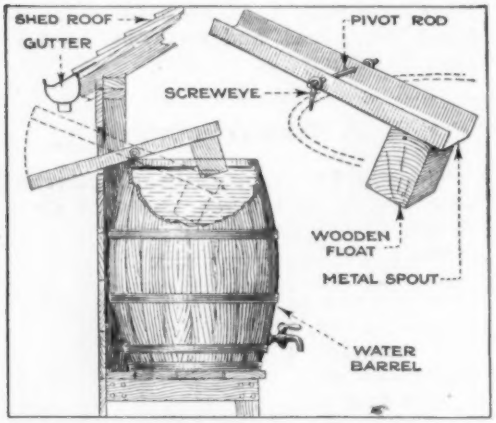
To Prevent Shade Tearing from Roller

It often happens that a window shade is a little short, or is pulled so far down that the tacks holding the shade to the roller are pulled out, or the cloth is torn away from them. A remedy for this trouble consists in removing the tacks from the middle section of the shade. Two cuts, about 3 in. long, are then made in the shade, as shown; this will form a section about one-third the width of the shade, and this section is passed to the opposite side of the roller and tacked. By this method the tacks will never come into the line of pull on the last turn of the roller, and there is always enough slack to allow easy starting again.—Chas. B. Post, New London, Ohio.



Simple Water-Barrel Regulator

In order to simplify the installation of a rain barrel and do away with the inlet and overflow pipes, as well as provide an



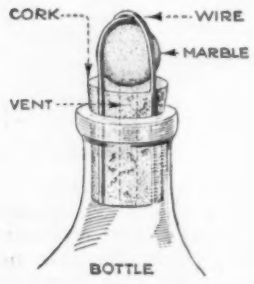
An Automatically Regulated Rain Barrel for Storing Soft Water: When the Barrel Is Full, the Auxiliary Spout Delivers the Rain Water on the Outside

automatic method for cutting off the flow when the barrel is filled, the arrangement illustrated was adopted.

A spout of sheet metal is pivoted to the edge of the barrel by means of screw-eyes and a transverse rod. The inner end of the trough is fitted, on the underside, with a wooden float so that as the barrel is filled, the float raises the spout and the water is diverted to the outside. As the water is drawn from the barrel, the outer end of the spout rises in readiness for the next rainfall.

Shaker Top for Bottles

A printer uses the device shown herewith to prevent evaporation of the gasoline used in cleaning his type of ink. The idea is simple enough and can be applied to any vessel in which a cork stopper can be used. When the container is inverted, the marble uncovers the hole through the center of the cork so that the liquid can be shaken out freely. When the bottle is upright, the vent is closed by the marble, effectively preventing evaporation of the volatile contents.—Howard Lindsey, Sacandaga, New York.

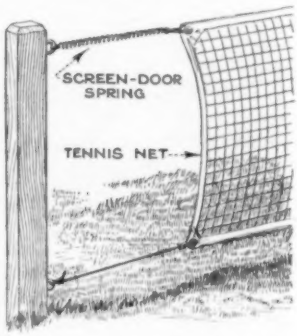


Soot Screen for Open Windows

A house cannot be well ventilated without open windows, but neither can a room be kept clean with soot and dust blowing in. Much, if not all, of the dirt nuisance can be overcome by covering the window opening with a piece of medium-heavy muslin, stretching it tightly across the window frame. The fabric is cut to fit the opening when tightly stretched, allowing an inch at top and side, to which the top parts of dress snaps or fasteners are sewed. The fixed, or bottom parts, of the snaps are fastened to the window molding, close to the sash. The cloth is then snapped into the corresponding fasteners and the screen is in place.

Holding Tennis Nets Taut

A tennis enthusiast has attached an ordinary screen-door spring to the posts on either side of his court for keeping the net stretched taut. A snap-hook is attached to the outer ends of the springs, for attaching to the eyelets in the upper corners of the net. The result of this arrangement is that the net never sags in the center, and the bother of drawing up and securing it from time to time is entirely overcome.—Chas. C. Grant, Chicago, Ill.



Repairing Carburetor Needle Valves

Failure of the carburetor needle valve to seat when depressed by the float caused an experimental temporary repair to be made, by coating the worn end of the needle with solder. The needle had been worn so that a small shoulder had formed which prevented the tapered end from seating. When coated with solder this depression was evenly filled. Instead of grinding the point to a seat, the valve was placed on the seat and tapped lightly into place.

Mildew on Leather

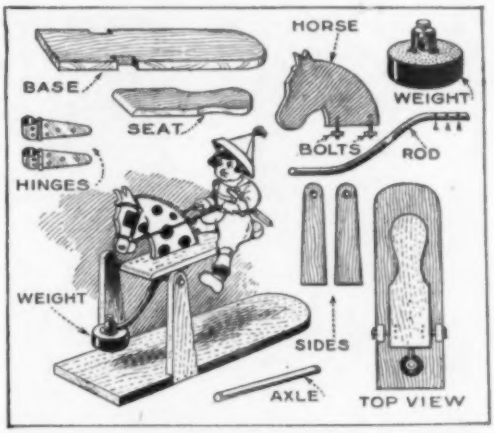
Any leather article is almost certain to mildew if kept in a warm, damp, and dark place, such as a closet, cellar, or stable. This mildewing will probably not seriously reduce the life of the article unless it is allowed to remain too long. It may, however, appreciably alter the color, thus injuring the appearance. The simplest way to prevent mildewing is to keep the leather in a well-ventilated, dry, well-lighted place, preferably one exposed to sunlight. When mildew develops, it should be washed off with soap and warm water, or simply wiped off with a moist cloth, drying the leather well afterward. These simple measures are more satisfactory than the application of preparations designed to prevent the growth of mildew.

A Novel Inverted-Light Reflector

An indirect-lighting fixture, which was made from a wicker basket to harmonize with the reed furniture of a room, was provided with a reflector made from a white china bowl. The handles were removed from the basket, which was suspended from the ceiling by three pieces of hemp rope, painted with gold bronze. The bowl is placed inside the basket. This suggests a use to which a basket with a broken handle, or a cracked bowl, may be put, as the handles are removed from the basket, and the crack in the bowl is not visible from below.

Seesaw Built for One

A single child, seeking means of entertaining itself, has a hard time in getting any pleasure out of the ordinary seesaw. The drawing shows a combination of seesaw and rocking-horse that can be used by one child. The construction is quite simple, the dimensions and weight of the counterweight being varied to meet different requirements. The seat is supported on an iron axle by a pair of strap hinges, one end of each hinge being bent to fit around the axle. The counterweight, which may be an iron casting, or

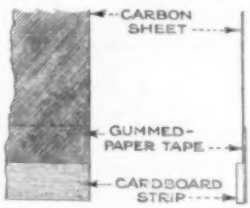


A Combination of Hobbyhorse and Seesaw That Makes It Possible for a Lone Youngster to Entertain Himself: A Counterweight is Provided for Balancing the Weight of the Child and Seat

a block of cement, is attached to a curved iron rod fastened under the front end of the seat. The counterweight should be a trifle heavier than the combined weight of child and board, and a little experimenting will be necessary to strike the correct balance. The exact mass of the weight can be found by first attaching a bucket or bag of sand to the end of the rod, and adding or removing sand until the proper weight has been found.

A Manifolding Aid for Typists

Typewritten manifolds are frequently spoiled when the writing is carried down too close to the edge of the first sheet. By sticking a strip of gummed-paper tape along the lower edge of the carbon paper, so that half is on the paper, then gumming a strip of cardboard to the projecting edge of the paper strip, the arrangement will pinch between the platen feed rolls of the machine, and prevent the sheets from rising too far. Do not stick the tape to the carbon surface, and, in use, allow the cardboard to come below the edge of the sheets; just how much depends on the amount of margin desired at the bottom. —Warren Scholl, Cleveland, Ohio.



Closet Concealed by Open Door

Occupants of an apartment in need of additional storage room noticed that a door in one of the halls was rarely closed,

The 14-Inch Space behind a Door is Used to Provide Additional Closet Room. A Set of Shelves was Built to Fit into the Space, and the Closet is Entirely Concealed by the Open Door

and as this door was hinged 14 in. from the wall, it was decided to build a closet in the space behind. The closet itself is a simple affair of two upright boards, which serve as supports for shelves. When the door is open and hooked with a screen-door hook, the closet is entirely concealed. As the shelves are not fastened to the wall, there can be no complaint from the owner and they can be removed at any time.

Lengthening the Life of Auto-Starter Gears

The constant use of the self-starter on an automobile during a period of three or four years will wear off the entering edges of the teeth on the rim of the flywheel, from the "clashing" contact with the steel driving pinion on the starting motor. On a four-cylinder engine, two badly worn spots will be noticeable on opposite sides of the flywheel rim, while on a six-cylinder engine there will be three such worn spots. If this wear is allowed to proceed too far, some of the teeth will eventually be broken, and may cause the complete wrecking of the starting motor.

The worn spots referred to occur between the compression points of an engine and are caused by the rotating starter pinion overcoming the inertia of the dead engine, and the sliding and grinding action of the rounded teeth before they have properly meshed with those of the flywheel. This can be stopped and a new lease of life given to the flywheel teeth by removing the flywheel from the crankshaft flanges, and shifting its position a quarter turn on the flange. This will, of course, make the valve-timing markings on the rim of the flywheel useless, and it should be re-marked. As there is no mechanical connection between the flywheel and the rest of the engine except the crankshaft, it makes no difference in what position it stands. This change is best made when the engine is taken out of the car for a general overhauling.

Rubber Mittens for Handling Brick

For rough work, such as handling brick, castings, lumber, and similar materials, damage to the hands from the sharp and jagged surfaces, or slivers, can be largely avoided by wearing mittens made from pieces of old inner tubes. A slit is cut in the side of the tube section; this allows the thumb to project, but protects the fingers and palm. It is unnecessary to close the end of the mitten, although this is easily done with a little rubber cement.—A. Swenson, Los Angeles, Calif.

Consecutive-Numbering Stamp Made from a Dater

An old dating stamp can be used to make a consecutive-numbering machine, which, while lacking the automatic and other desirable features of the regular machine, will answer the purpose in many cases. The date numbers of two stamps can be used, one of the frames being discarded. For numbering up to 99 no change is necessary, except to remove the bands stamping the month and year, but if numbers of more than two places are required, open up the frame of one stamp and put the numbered bands, with their changing wheels, into the other frame; this combination makes it possible to stamp numbers of four figures.

Double Horn for Autos

The alternating-current horn used on a familiar type of light automobile is not a particularly effective warning at low engine speeds. Many owners of such cars have therefore equipped them with hand-operated horns for use in emergencies.

In such cases, in order to avoid the necessity of having two separate horn buttons in different locations, the electric-horn button can be mounted on the top of the hand horn. By this arrangement, a light pressure will operate the electric horn, while, if a little more pressure is applied, both horns will be caused to sound simultaneously.—D. S. Crabtree, Bridgeport, Conn.

Washing Machine Driven by Engine in a Detached Building

A farmer makes use of the arrangement illustrated for driving the family

Using a Gas Engine Located in a Detached Building to Drive the Washing Machine in the House: Shafts Extend through the Buildings for the Belt Drive

washing machine, which is located on an inclosed porch of the house, by a small gasoline engine placed in a near-by engine room. Short shafts are run from the washing machine and engine to the outside of their respective buildings, and pulleys are provided for the belt drive, which is used only on wash day.—Dale R. Van Horn, College View, Neb.

A Homemade Magazine Rack

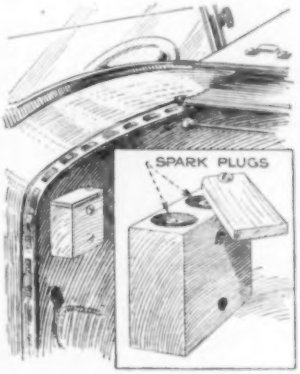
The magazine rack illustrated will be found a great help in keeping the room tidy, and the magazines and periodicals in one place. Each side is cut from a single piece of ½-in. board. The bottom is made from two pieces of 1-in. board, and is made to slope toward the center. There is a rack across the middle of the stand for holding the books being read or referred to by members of the family. The magazines slip underneath the bookrack, and as they lie at

A Homemade Magazine Rack Which Is of Help in Keeping the Room Tidy and the Periodicals in Neat Order

an angle, one can easily read the titles and remove the publications desired without disturbing the others.—C. L. Meller, Fargo, N D.

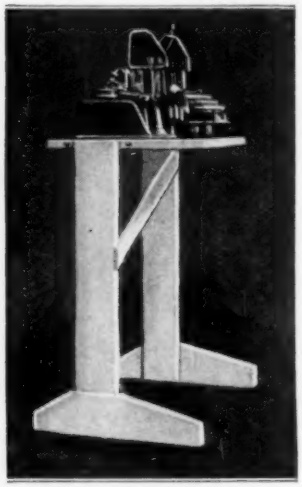
Container Saves Spark Plugs

Extra spark plugs are often carelessly thrown into the toolbox, with the result that the jack, pump, or other implement is dropped in on top of them, breaking the porcelain, and besides, a litter of tools must be "pawed over" to find the plugs, when needed. A container similar to the one illustrated saves its cost by protecting the plugs against damage, and makes them instantly available. A wooden block, 2 by 4 in. in cross section, and of suitable length, has two 1½-in. holes drilled in it, is fitted with a swinging cover, and fastened to the engine side of the dash. This container carries two spark plugs, and affords them ample protection.



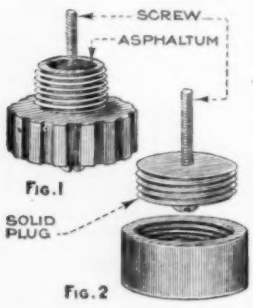
A Simple Typewriter Stand

The illustration shows how a substantial typewriter stand can be easily made from a few scraps of lumber. The table consists of two legs with long feet at the bottom, a top for the typewriter to rest on, and a brace across the legs. If the table is assembled solidly, using screws instead of nails, it is quite substantial. It is also neat in appearance and can be finished to harmonize with the other pieces of furniture.—R. E. Deering, Ottawa, Kan.



Instrument Knobs Made from Storage-Battery Plugs

The radio fan who is pressed for cash while building his set can save a little by making his own instrument knobs from old storage-battery plugs, which can be obtained for little or nothing at almost any battery station. There are two types of such plugs; those with an outside or male thread, Fig. 1, and those built like a cap, with internal or female threads, Fig. 2. The former are the easiest adapted and are stronger than the latter. Two methods of attaching the screws to the knobs are illustrated, although others will readily suggest themselves. In most cases it will be found easiest simply to center the screw in the cap and fill the cavity with melted battery-sealing compound, sealing wax, or asphaltum.



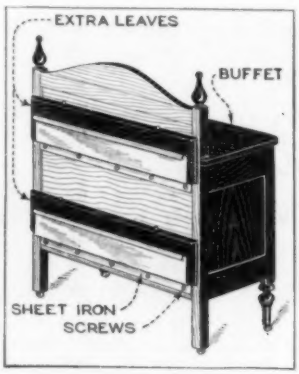
¶Your radio questions, if sent to our Bureau of Information, will be answered by an expert.

Testing Lubrication of an Auto

A lubricating difficulty that shows itself by burning out the front connecting-rod bearings and scoring the cylinder of a light automobile, is caused by clogging of the oil-feed pipe that carries oil from the flywheel to the forward end of the crankcase. As a test, to determine whether the oil pipe is open, in cases where the engine shows symptoms of trouble from this cause, it is only necessary to remove the right-hand crankcase-cover screw and start the engine. A stream of oil issuing from the open screw hole will remove any doubt of the oil feed being clogged. If desired, this screw may be replaced by a small petcock which can be opened while the engine is running.

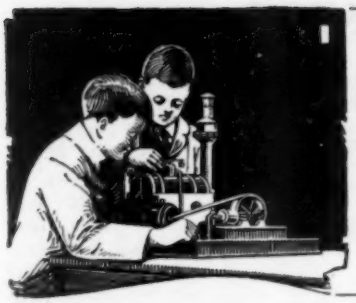
Storing Extra Table Leaves

It is sometimes quite a problem to the housewife to know where she can best store the extra leaves of the dining-room extension table, so that they will be out of sight and at the same time readily accessible; the drawing shows how one housewife solved it. Pieces of sheet iron, about 6 in. wide, were bent to the shape shown; holes were drilled along the lower edge for screws, and the upper edge was slightly curved outward to prevent scratching and marring the finish of the leaves. These brackets were then screwed to the back of the buffet. The leaves drop easily into place without moving the buffet; as the baseboard prevents it from coming close against the wall, there is generally plenty of room for the leaves.



Chain for the Clothes Closet

A piece of light chain, stretched taut between the walls of a clothes closet, is fine for holding coat hangers. The hooks of the hangers can be caught in the links so that there is no danger of their sagging together at one point, as they do when a cord, wire, or pole is used.



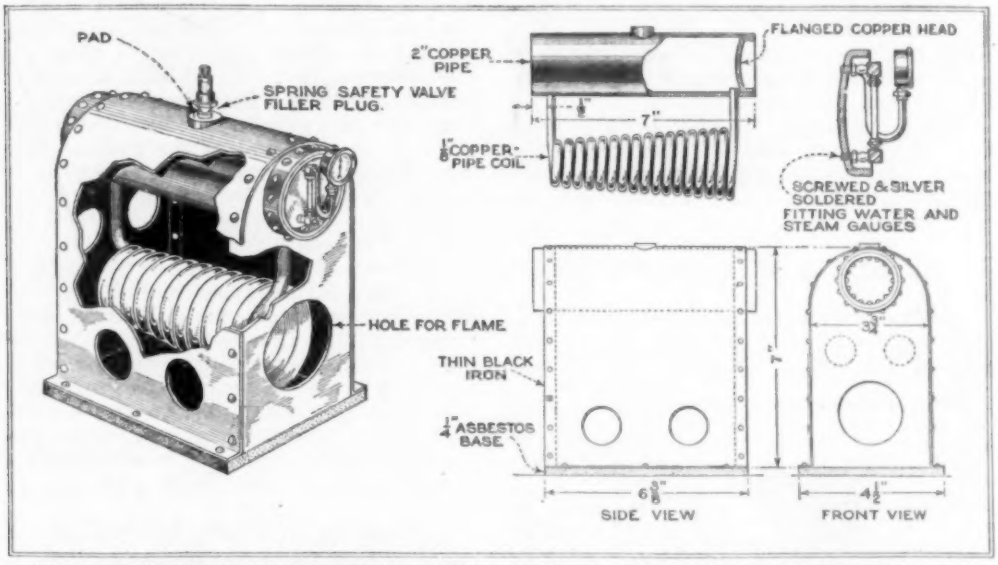
A STEAM BOILER FOR MODEL ENGINES

By D. M. RICE

MODEL steam engines, of either stationary or marine types up to ¼ horsepower, can be successfully operated by the miniature boiler shown in the drawing. Such a boiler is designed to be heated by a blowtorch, which makes it possible to generate the working pressure of steam in a very short time; by varying the design slightly, an alcohol lamp may be used under the copper coil, which will also give good results.

The boiler is a simple affair, although a little skill will be required to form the convex heads; these are made from disks of sheet copper, ⅛ in. thick and 2¾ in. in diameter. The disks are beaten hollow with a light ball-peen hammer, or pressed out in a simple die. The depth of the hollow should be about ⅜ in., and, if the hammer is used, care should be used in beating the metal to see that the strokes are not so heavy that the thickness of the metal will be reduced. After the proper convexity has been given to the disks, a piece of hardwood is turned down to 1¾ in. in diameter, and a convex face, that will fit neatly into the hollowed disk, turned on one end. A small hole is drilled in the center of each disk, and they are then fastened, one at a time, to the end of the rounded block with a small wood screw. The copper is hammered lightly along its outside edge, turning it down parallel with the sides of the block until a nicely flanged boiler head is obtained. After the heads have been flanged in this manner, the small hole in the center is stopped with a rivet and covered with solder.

The boiler shell is made from a 7-in. piece of copper or brass tube, 2 in. in diameter. Drill a hole near each end to receive the ends of the copper coil, as shown. On the opposite side of the shell, rivet or braze a small metal disk, or pad, about ⅛ in. thick. This pad should be filed on its underside to conform to the curve of the boiler shell, and is necessary for attaching the safety valve, as the metal of the shell is not thick enough to



A Miniature Boiler for Model Steam Engines of Either Stationary or Marine Types: The Boiler is Heated by the Flame from a Gasoline Blowtorch Directed through the Center of a Coil of Copper Pipe Attached to the Underside of the Shell

permit tapping the threaded hole. A safety valve is absolutely necessary. No provision is shown for the steam outlet of the boiler, as this may be located to suit different conditions, but a pad, similar to the one described for the safety valve, must be provided for the steam pipe. Although the steam outlet may be placed in various positions, it is, in all cases, necessary to place it above the waterline, and standard practice should be followed by placing the steam pipe on top of the boiler.

The spiral copper-tube heating coil should next be made and fitted to the holes provided for the purpose on the underside of the boiler shell. About 9 ft. of copper tubing, with an internal diameter of ⅛ in. will be required for this coil, which is wound around a piece of rod or pipe 1¾ in. in diameter. The mandrel is placed in a vise and 21 turns of the tubing are made around it. The coil will be improved if it is tapered, as shown in the drawing, although this is not essential. The ends of the completed coil are fitted into the holes provided in the underside of the boiler, in such a manner that they project about ¼ in. on the inside. The ends of the coil should be well brazed or silver-soldered to the inside of the 2-in. pipe forming the boiler body.

When everything else has been done in the order and manner described, the heads, which must be left to the last, are fitted into the ends of the boiler shell and fastened with rivets. The easiest way to do the work is to fasten both boiler heads with the flanges out and with their convex faces toward the center of the shell; this arrangement makes it possible to rivet both heads from the outside with soft-iron rivets. After the heads have been riveted, both the rivets and the seam between the flange and boiler shell should be well sweated with silver solder, or brazed, to insure an absolutely steam-tight job and increase the strength.

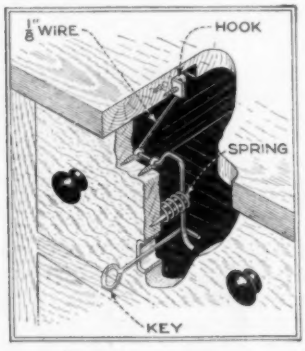
The water glass and steam-pressure gauge, which should form a part of the boiler fittings in all cases, are screwed into holes tapped in the front boiler head, and then silver-soldered or brazed.

Very little description is required for the boiler setting, which, as shown by the drawing, is made of sheet iron, fastened to an asbestos-board base.

After completing the setting, the boiler is ready for testing. After unscrewing the safety valve, fill the boiler and coil to within ½ in. of the top with water; replace the safety valve and set it at the desired pressure, which should, in no case, exceed 50 lb. If the steam pipe has not yet been connected to the engine, remove it from the boiler and screw a plug into the steam outlet. The boiler should be heated slowly the first time, by applying the flame of a gasoline blowtorch through the hole in the front of the casing. Any small leaks which may be detected can be brazed, or stopped by calking.

Simple Lock for Drawer or Chest

A simple lock for a drawer or chest, that will make it impossible for anyone not in the secret to open the drawer without resorting to force, can be made in a few minutes.



A piece of stiff wire is bent to the shape shown in the drawing and fastened to the inside of the drawer case with screweyes. A piece of spring wire is wrapped around a rod to make a compression spring, which is slipped over the staple provided for the stem of the lock; this spring locks the drawer automatically when it is closed. A hook, bent on the upper end of the wire, fits into a slot cut in the underside of the chest top; the front of this slot is fitted with a brass wearing plate, against which the hook bears. The lock is opened by a bent-wire key, inserted into the keyhole and turned until the bent end comes over the stem end of the lock, which is pulled forward.—A. K. Harrison, Chicago, Ill.

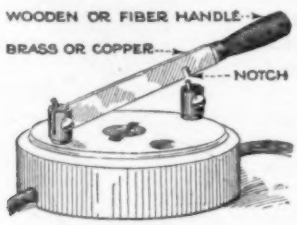
Mounting of Shade Allows Top and Bottom Ventilation

There are occasions when it is desirable to admit light or air from the top of the window, which is impossible with the ordinary arrangement of the window shades. A simple method by which this is made possible is to mount the shade roller across the middle of the window opening. The blind is removed from the roller, folded in the middle and tacked on again at this point. This arrangement will make it necessary to hem the plain end so

that a stick or rod can be inserted. A weighted cord from the upper end of the blind passes over a pulley, or through a screweye, in the top of the window frame, and serves to hold the shade taut. The curtain is operated from the bottom of the window, as usual, but when the lower half of the blind is pulled down, the upper part will be pulled toward the top by the weight, and when the lower half is rolled up, the upper section will also be wound around the roller. An arrangement of this sort makes it possible to ventilate a room from the top as well as the bottom of a window.

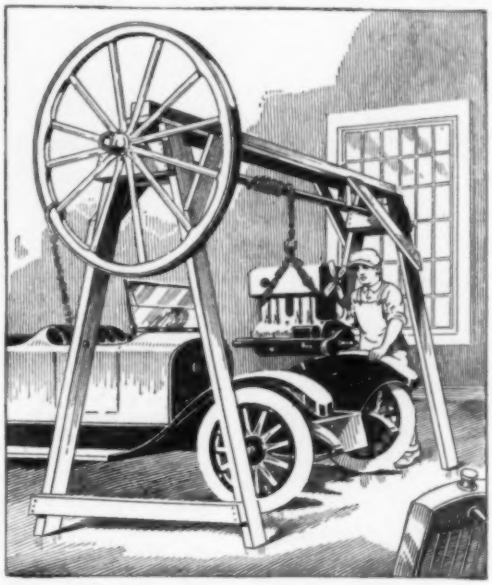
Knife Switch Made from Old Snap Switch

When snap switches become so worn that they are beyond repairing, a knife switch can be made from the porcelain base and terminals that remain after other parts have been removed. Such a switch will prove quite an acceptable article in experimental work. The old center of the original switch is removed and discarded, as are also the spring clips on each terminal. A piece of brass or copper, about 3 in. long, is made into a switch blade, and provided with a wooden or fiber handle. A hole is drilled at the end for the terminal screw, and a notch is cut in the edge just back of the handle, to fit over the terminal screw on the opposite side. Slots must also be cut through the center of each terminal, for the switch blade.



Repair-Shop or Farm Hoisting Gear

For hoisting automobile engines from their chassis, lifting bodies, and other heavy work, an automobile repairman uses the hoisting arrangement shown in the drawing. The main structure is of wood, with a piece of heavy 3-in. pipe supported on wooden bearings, parallel with the horizontal crosspiece. An eyebolt, to which one end of the hoisting chain is attached, is fastened to the center of the pipe. An old wagon wheel is pinned to the outer end of the pipe and provides a means for turning the pipe and winding up the chain. This arrangement produces a powerful leverage. A holdfast for retaining the hoist in any position is provided by a short chain and hook fastened to the woodwork, the hook being slipped over one of the spokes in the manner shown.

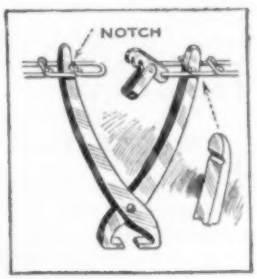


This Simple Windlass Arrangement Consists of a Wagon Wheel Pinned to the End of a Piece of Heavy Pipe, Which is Supported on Wooden Bearings

Iron straps, in addition to the bearings, are provided, for supporting some of the weight of the load on the pipe. The usefulness of this device is not confined to the shop. It will be found exceedingly handy around the farm, for lifting wagon tops, or other heavy work.

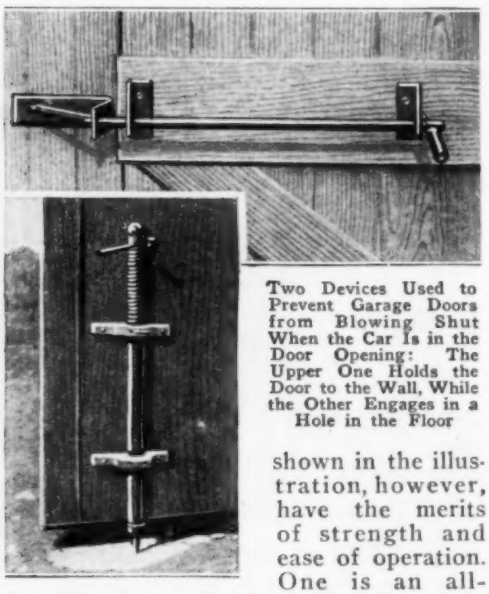
Applying Auto-Tire Chains

Automobile users are familiar with the trouble encountered in applying a set of antiskid chains tightly enough to prevent them from coming off the tire or striking the fenders. The drawing shows how the ends can be fastened together with the tire-chain repair pliers, which should form a part of the car's tool equipment. A notch is filed on the inner side of each of the handles, which are inserted into the chain links as shown. The handles of the tool are then pressed together and the fastener hooked. —George Elleson, West Allis, Wis.



Holding Garage Doors Open

All manner of devices are used to prevent the garage doors from blowing shut while the car is in the opening; the two



Two Devices Used to Prevent Garage Doors from Blowing Shut When the Car Is in the Door Opening: The Upper One Holds the Door to the Wall, While the Other Engages in a Hole in the Floor

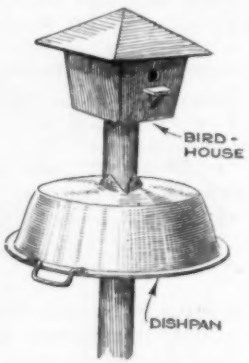
shown in the illustration, however, have the merits of strength and ease of operation. One is an all-metal fastener, which requires an angle iron fitted to the outside wall of the garage, but which works independently of the ground and floor. Instead of a simple hole in the angle iron, it is better to make a vertical slot to allow for sagging of the door. The other, a lighter fastener, consists of a piece of hardwood curtain pole, with a coil spring, to keep it up when not in use. When the door is to be held open, the rod is pushed downward, so that a metal pin driven into the lower end engages in a hole in a small block of cement which is imbedded in the ground. A pin in the top of the pole catches into a notch in an iron plate, when pushed down to hold the door; the other end of this pin forms a handle for swinging the rod around, to release it from the notch.

The Use of Lacquers

There are two kinds of lacquers on the market—dip and brush. A dip lacquer is made in such a manner as to give the best results when the articles are dipped in it. Brush lacquers are intended to be applied to the work with a brush, and do not give satisfaction when used for dipping. To produce the best results it is necessary to use a lacquer that is made especially for the kind of metal on which it is to be used. As a general rule, brass lacquer is colored yellow, while one used on silver articles is colorless. Lacquers should not be rubbed onto the work, like paint, but should be flowed on, like enamel, so as to obtain as smooth a finish as possible, without brush marks showing. After the work is done, all the brushes should be wiped on old newspapers until they are as dry as possible, cleaned with turpentine, and put away where they will not accumulate dirt.—W. S. Standiford, Youngstown, Ohio.

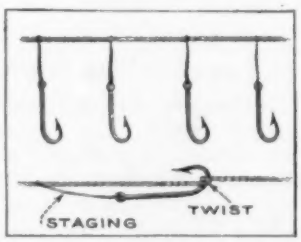
A Dishpan Cat Guard for Birdhouse

To protect birdhouses and feeding tables from the raids of cats, an effective guard can be made from an old dishpan. The pan is turned bottom up, and three slits are cut in the center, the metal between the cuts being turned back to form ears, by means of which the device is nailed to the pole. When the birdhouse is protected in this manner, a cat or other marauder cannot reach the top of the pole and disturb the bird residents or visitors. —L. B. Robbins, Harwich, Mass.



Taking Up a Trot-Line

When taking up a trot-line, the usual result is a bad tangle of hooks and line, which is difficult to avoid unless the staging is removed entirely. The drawing shows a method that entirely overcomes the trouble. Each staging is pulled tightly along the line, and the cord is given a single twist around the hook. After all the hooks have been treated in this manner, it is a simple matter to wind up the whole line without danger of tangling; when the line is set again, all the hooks will be in place and there will be no snarls.



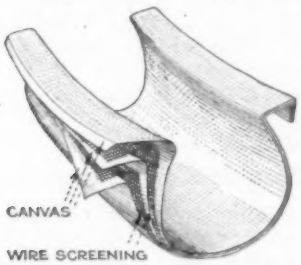
Cleaning Auto-Starting Gears

The pinion and driveshaft of the starting motor on most automobiles are usually neglected by the owner until the day comes when they refuse to turn over the engine.

The usual symptom of a dirty drive is the humming of the starting motor, without the engine being cranked, when the starter button is pressed. This is caused by dirt or even heavy oil getting on the driveshaft, and preventing the pinion from screwing out and meshing with the teeth on the flywheel. Generally, it is only necessary to remove the floorboards to expose the starter pinion and flywheel, and then wipe off as much dirt as possible with a clean rag. If a blowtorch is at hand for spraying gasoline, it can be used to clean the driving mechanism thoroughly. Gasoline applied with a brush will also remove all accumulated dirt and gum. After the gasoline has evaporated, oil the mechanism with a small quantity of very light oil. This part of the car should be cleaned at least once a year.—G. W. Greene, Madison, Wisconsin.

A Long-Lived Blow-Out Shoe

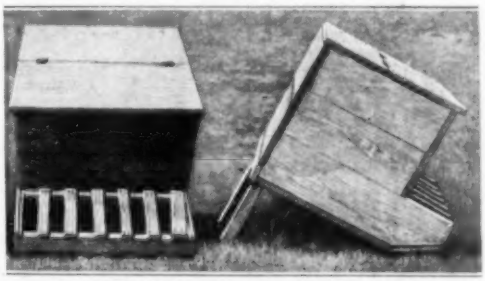
Most blow-out shoes, when used inside a tire, have a tendency to blow out through the tire, as soon as one or two layers of the fabric have been worn through. This trouble was overcome, in one instance, as follows: Two thin blow-out shoes were laid together,



with a layer of steel screening, which is somewhat finer than common screen wire, between them. The wire layer was held in place by sewing it to one of the shoes with waxed shoe thread, after which the two shoes were cemented together. The edges of the shoe that projected under the tire were fastened together at several points with split rivets. This reinforcing was found to impart superior wearing qualities. Later a homemade patch was made, along similar lines, from three layers of heavy canvas with a layer of wire between them, as shown in the drawing, the whole being cemented together, to prevent creeping.

Self-Feeder for Poultry

Every poultry raiser or farmer who keeps poultry knows the advantages of a self-feeder, and the pictures show how

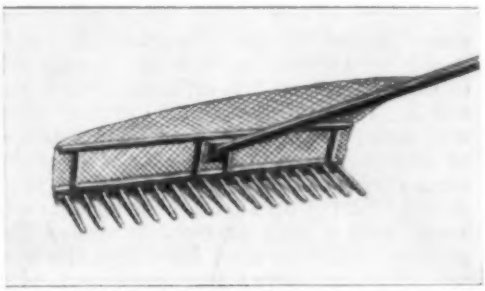


Front and End Views of a Poultry Feeder That can be Made at Little or No Expense: The Back is Elevated So That There will Be a Constant Supply of Feed at the Front

such an article can be made from an old box or scrap lumber. This feeder is 2 ft. wide, 2½ ft. long, 2 ft. high at the front and 2½ ft. at the back. By elevating the back in the manner shown, there is always a constant supply of feed at the front, which is not always the case if the feeder is set level.—H. J. Engel, New Braunfels, Texas.

An Improved Leaf Rake

A rake which is especially useful for raking leaves from the lawn is shown in the illustration. It can be made from a



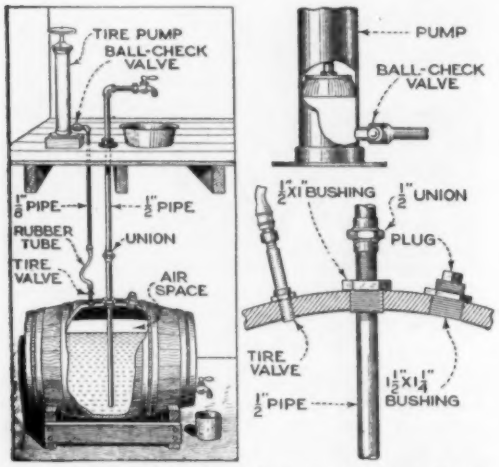
A Rake Which does Not Dig into the Ground Is Especially Useful in Cleaning a Lawn of Dead Leaves

common wooden rake, which has one edge planed to a slight bevel; on this edge is built a light framework to carry the handle, as shown.

The bevel throws the teeth slightly downward, so that the points just touch the ground. To prevent the accumulated leaves from flowing over the back of the rake, a piece of wire netting is tacked over the frame, a section being brought over and fastened to the handle.—H. N. Posz, Winona, Minn.

Dispensing System for Oils and Other Liquids

A country resident bought his kerosene oil, for illuminating and cooking purposes,



An Oil-Elevating System, Used by a Householder to Draw Off Supplies of Kerosene for Domestic Purposes: It can be Applied to Good Advantage in Garages and Shops

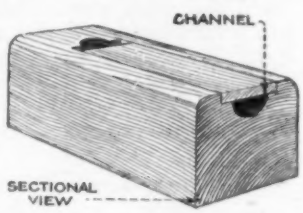
by the barrel, and kept it stored in the basement. In order to make it convenient to draw a supply of fuel from the barrel without descending to the basement, the arrangement illustrated was used to raise the oil to the upper floor.

A sound, tight barrel was set in a wooden cradle and three holes were drilled in the top of the vessel. The one in the exact center of the bilge was 7/8 in. in diameter, another hole, 6 in. to one side of the center was 1 3/8 in. in diameter, and another on the opposite side of the center was made small enough to accommodate an ordinary tire valve. The large holes were threaded for reducing bushings, as shown, the 1½ by 1¼-in. bushing screwed home, and a plug screwed into it. The plugged hole was used for filling the barrel. The discharge line consisted of a piece of ½-in. pipe, 6 in. longer than required to reach the bottom of the barrel. One end of this pipe was threaded for a distance of 8 in. and the 1 by 1½-in. reducing bushing screwed on, so that the threaded end of the pipe projected at least 6 in. above the flange. The pipe was inserted into the oil barrel to within an inch of the bottom, and the bushing screwed home. A tire valve was threaded into the smallest hole, all joints and threads being coated with white lead to insure tightness. The oil was conducted to the upper floor by the piping arrangement illustrated. Air pressure was used to elevate the oil to the outlet and this was provided by means of an ordinary automobile tire pump. A ball-check valve was connected to the base of the pump to prevent escape of the air. The pump stirrup was then bolted to the floor, and the air outlet conducted to the tire valve on the barrel as shown.

In use, the barrel was never completely filled, an air space of about 2 in. being allowed in order to create pressure. Then, when oil was desired, a few strokes of the pump created the necessary pressure to raise the fuel when the stopcock upstairs was opened. About ½ lb. of air pressure should be allowed for each foot the oil is to be raised.

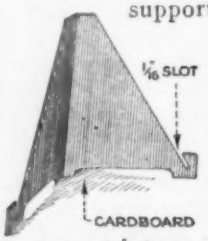
Miteless Poultry Roost

A piece of 2 by 2-in. material is molded as shown in the drawing, with a semi-circular groove. A strip of wood, about ¼ in. thick and wide enough to cover the cavity, is glued into a recess cut in the top, as shown. This leaves a covered channel which extends to within 1 in. of the ends of the roost. The groove is filled with kerosene from time to time, and this effectively prevents mites from reaching the fowls. The pores of the wood will soon become saturated with the oil, and none of the parasites will go near the roosts.



Easel for Showcards and Photos

By using a triangular piece of cardboard, a neat and inconspicuous easel for supporting photographs, showcards, and similar articles, can be easily made. The cardboard is folded in the center, and, if heavy stock which is liable to break, is used, a strip of muslin can be glued over the crease. Slots are cut into projections left on the bottom corners, and care must be used in cutting these, to prevent the projections from breaking off. In use, the article to be displayed is placed in the slots, after the easel has been bent.—Eugene O. Blessing, San Francisco, Calif.

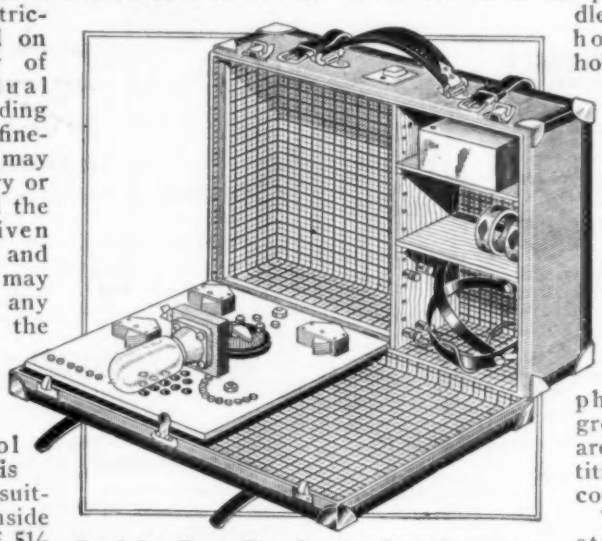


A PORTABLE RADIO RECEIVER

By F. L. BRITTIN

BOY scouts and other outers, who desire a portable radio-receiving set that has a receiving and tuning range beyond the usual crystal-detector instruments, will find that the single vacuum-tube apparatus described in this article meets their requirements. Honeycomb inductance coils are used so that the set can be tuned to any damped or undamped wave length between 200 and 15,000 meters.

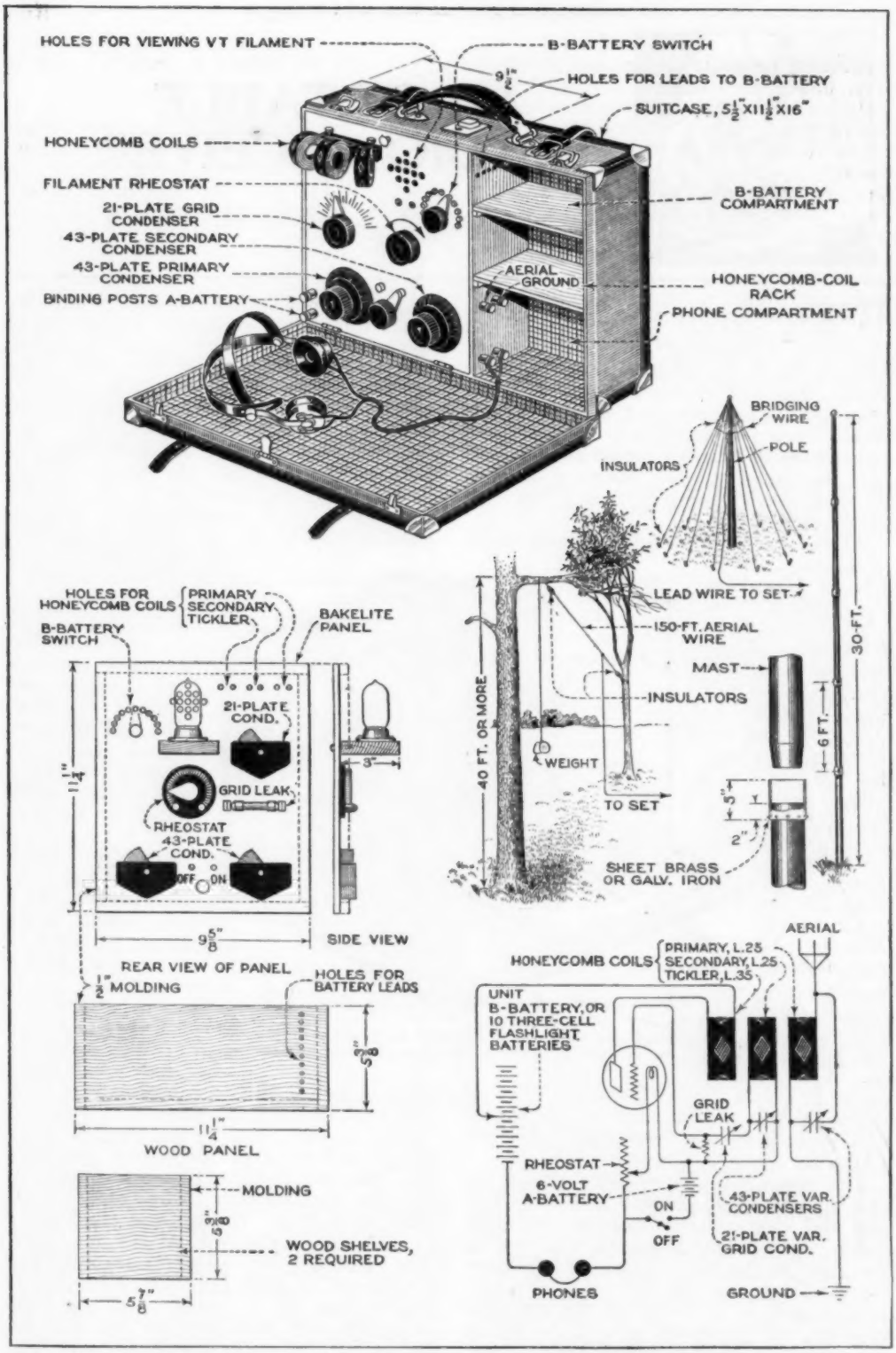
At the outset it should be understood that no restriction is placed on the ingenuity of the individual builder, in adding features or refinements that he may deem necessary or desirable, and the dimensions given for the panel and other parts may be altered in any way to suit the available space. The original set was built into a school case, which is a miniature suitcase, having inside dimensions of 5½ by 11½ by 14½ in. The bakelite panel is set in ½ in. from the edge of the open case, so that there will be plenty of clearance for the knobs and switches when the cover is closed.



Panel Let Down Flat, Showing Back-Mounting of the Condensers, Rheostat, and Vacuum-Tube Socket

The panel is held in place inside the case against ½-in. square wooden strips and the edge of the wooden partition. Small brass hinges are used for hinging the panel to the lower strip, and a cabinet catch is placed at the top; this arrangement makes it possible for the operator to swing the panel out at will, to get at the circuit or back-mounted instruments. The remainder of the space, at the right of the partition, is divided by shelves into compartments for the B-battery, honeycomb inductance coils, and headset. The upper shelf is for the B-battery, which may consist either of 10 three-cell flashlight batteries or a standard unit; if flashlight batteries are used, they should be taped together with friction tape, connected in series, and tapped off to the B-battery switch on the panel. Small flexible lamp cord is used for the battery connections, and these are led through holes drilled in the partition. The middle shelf holds the honeycomb coils; holes are drilled in the shelf to take the plugs, so that the coils are carried upright, and without rattling. The telephones are carried in the bottom compartment, free from possible knocks and jars, on a piece of felt glued to the bottom. The phones, aerial, and ground binding posts are shown on the partition in the phone compartment.

The necessary instruments can be mounted in various ways, but the arrangement shown in the drawing is a very neat one, with the two 43-plate condensers and switch at the bottom, the 21-plate condenser and filament rheostat in the middle, and the B-battery switch holes for viewing the vacuum tube, and inductance at the top. The 43-plate condensers should have a capacity of .001 mf. each. The 21-plate grid condenser should have a capacity of .0005 mf. The honeycomb inductances are mounted on a standard mounting unit, which allows the coils to be swung back and forth to vary the coupling; these coils must, of course, be removed when the case is closed. A



A Small Vacuum-Tube Radio Receiver for the Use of Boy Scouts and Campers: With the Proper Coils, the Wave-Length Range Is from 200 to 15,000 Meters. Two Types of Aerial, with the Method of Erecting, are Shown in the Right Center

standard 2-megohm grid leak is placed just above the switch, and the vacuum tube is mounted on a standard base, screwed to a wooden block that is fastened to the panel with two screws; tube sockets for mounting directly to the panel are available as an alternative to the method described. The wiring is No. 16 rubber-covered fixture wire; all joints should be soldered, and no more wire used than is absolutely necessary. The binding posts for the A-battery are shown in the lower left-hand corner of the panel; this battery is for lighting the filament in the VT-tube and four or five ordinary dry cells will answer, or, if an automobile is handy, the necessary current can be drawn from the storage battery. The phones should be wound to at least 2,000 ohms' resistance. In buying the several instruments for the panel, get short, flat knobs for the condensers and rheostat; for space is at a premium, and this should be kept in mind throughout the assembling of the set.

The simple wiring circuit is clearly shown in the drawing, and, if carefully followed, will give excellent results.

The best outdoor aerial is a No. 14 copper wire, or stranded phosphor-bronze wire, 150 to 200 ft. long, with a small insulator (not porcelain) at each end. A piece of light rope, with a weight fastened to one end, is tied to one of the insulators and thrown over the limb of a tree as far as possible above ground, care being taken to have an open space free from obstruction for stretching the wire. The other end of the aerial is tied to another tree, about 5 or 6 ft. from the ground, and a lead wire to the set is soldered in place.

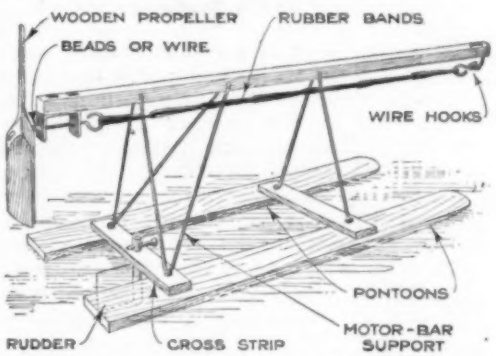
The umbrella type of aerial shown is generally used in the army signal corps for field work, but is more complicated. The wires are brought out from a common point from the top of the jointed mast and staked out from insulators. A 6-ft. iron rod driven into the earth makes a good ground for both types; if a stream is near by, the end of the ground wire can be weighted and submerged.

Warming Up the Auto

When starting up the car on a frosty morning, or at any other time after the engine has become cold, when there is a persistent popping at the carburetor, and lack of power in the engine, a simple expedient is to place a piece of newspaper over the front of the radiator. The suction of the fan will hold the paper against the radiator, and, after a few minutes of running, the engine will attain normal operating temperature.

Making a Toy Water "Scooter"

The drawing shows a water "scooter" that can easily be made by the average boy from a few bits of light board, some stiff wire, and a handful of rubber bands. The pontoons are tapered at the stem of the craft and are held the right distance apart by cross strips. The propulsive mechanism of the scooter is mounted overhead. The propeller is the most difficult part to make, and possibly some experimentation will be necessary to get the most effective result; however, the important thing to remember is, that it must be balanced accurately and lined up well to insure smooth running. It is mounted on a wire shaft supported by a tin bracket, but before assembling the propeller in its bearing, a few beads or a few loose turns of wire should be slipped over the shaft, as indicated, to provide clearance. The actual power is furnished by a long rubber strip, or a number of rubber bands looped together, the rubber strip thus obtained being dusted with talcum powder and fastened, at one end, to the propeller, and at the opposite end to the overhead wooden strip, as shown. Powerful rubber bands can be cut from an old inner tube. If desired, a rudder may be added to the boat so that it can be made to travel in a circle instead of a straight line. Such a scooter, lightly constructed and with a sufficiently powerful rubber-band motor, will travel at good speed for about 50 feet.—D. W. Clark, Buffalo, N. Y.

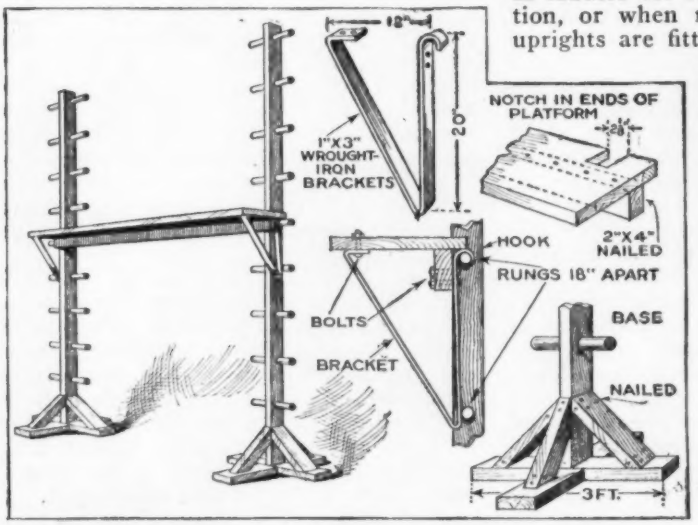


A Water "Scooter" Driven by a Rubber-Band Motor, That can be Easily Made from Light Strips of Wood, Is Capable of Good Speed for Voyages That Average About 50 Feet

An Adjustable Portable Scaffold

A portable scaffold that is light in weight, simple in construction, and readily adjustable, is made in the manner indicated in the drawing.

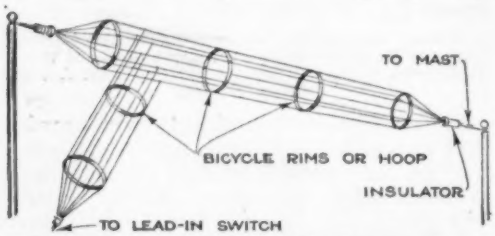
The scaffold uprights are built of 2 by 4-in. lumber, and can be used individually as ladders for setting the horizontal section, or when moving it higher. These uprights are fitted with rounds of ¾-in. pipe or 1-in. oak, about 9 in. long, and the 3-ft. crossbars at the lower ends make the scaffold as stable as the usual ladder. The platform is a 12-in. plank with a 2 by 4-in. piece nailed near one edge, as indicated in the drawing. Wrought-iron brackets, provided with a hook at one end to catch over the projecting rounds of the uprights, are bolted to the ends of the platform, and notches are provided in it, to fit around the uprights, and prevent the platform from shifting sidewise.—G. A. Luers, Washington, D. C.



A Portable Scaffold That Is Light Yet Substantial, and That can be Adjusted to Varying Heights: The Uprights can be Used Separately, as Ladders, When Necessary

New Type of Cage Antenna for Radio Stations

The cage type of aerial is gaining considerable favor with commercial and amateur operators, as it is easy to construct, economical in the number of insulators required, eliminates much trouble due to poorly soldered joints, occupies less space, and offers less resistance to the wind than the old flat-top type. Height is essential in this type, as the lead-in is also of the cage type, which adds to the capacity of the aerial. With this kind of antenna and lead-in it is possible to get greatly increased range of radiation on 200 meters. A good ground system is required, and good results cannot be obtained without giving as much attention to the grounding as to any other detail of the transmitting equipment. Either a suspended counterpoise or buried ground should be used, the latter being formed by burying 60-ft. lengths of No. 14 bare copper wire in the ground, the wires being laid to radiate fanwise under the aerial. This size bare copper wire is also used in the construction of the cage aerial, and a long insulator is used at each end of the cage; the spreaders or hoops are made of heavy wire, or discarded bicycle rims, which are light and strong, can be used, the separate wires forming the cage being secured to the hoops by several turns of wire, and then soldered. The ends of the wires are brought together, carefully soldered, and fastened securely to the insulators. The lead-in wires are soldered to the cage wires, and too much emphasis can hardly be placed on the necessity of careful soldering, as loose joints greatly reduce efficiency. All guy wires should be "broken up" with small insulators. The masts that support the aerial should both be of the same length so that each end of the aerial will be the same distance from the ground.



The Cage-Type Aerial is Highly Recommended to Amateurs, as It Is the Most Efficient Type for Stations Operating on a 200-Meter Wave Length

¶A small lump of sealing wax can be used to take the place of broken typewriter keys.

of wire should be slipped over the shaft, about 50 feet.—D. W. Clark, Buffalo, N. Y.

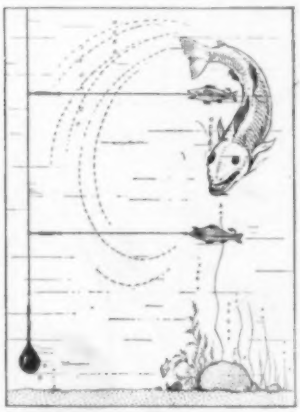
Bathing-Cap Ornaments

The ordinary soft-rubber bathing cap may be decorated with designs and monograms cut from the cementless rubber-patch material that forms a part of the equipment of practically every motorist, or which can be obtained for a small sum.

The design is penciled on the stock, then cut out with a pair of sharp scissors or a knife, and applied to the cap in the same manner as when patching a tire.—Harold McMahon, Hatchville, Mass.

Trolling Rig for Autumn Lake Trout

Lake trout strike best in the autumn, and the drawing shows a method of getting down to them that will commend itself to the angler. This fish as well as others, such as the wall-eyed pike, are found in deep water, and unless the lure is dropped deep no results are obtained. The main line is weighted at the bottom with an 8-oz. pear-shaped dipsey. The branch lines are connected to the main one, at intervals of about 4 ft., by swivels, which prevent kinking and twisting. The minnows are fastened to the double hooks in the manner shown. The bottom depth is now found and the surface point marked on the line, so that the fisherman can troll some 3 or 4 ft. off the bottom.

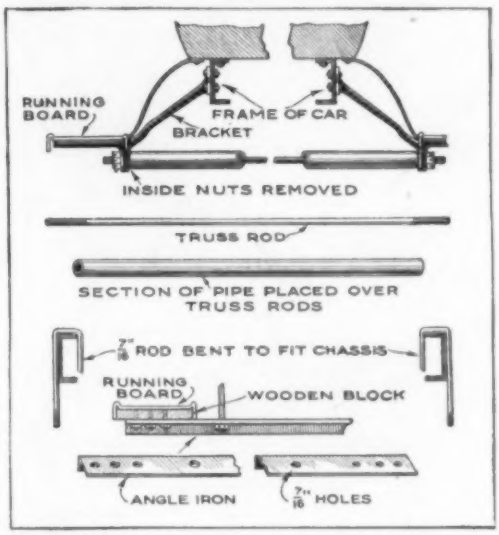


Overcoming Sagging Running Boards

The tendency of the running boards of a light automobile to sag down can be largely prevented by reinforcing the brackets by a horizontal brace underneath the car.

Referring to the drawing, it will be seen that a suitable length of pipe, placed over the truss rods, can be used to make a substantial brace and prevent bending of the running-board brackets—the real cause of sagging running boards.

A more substantial method, and one that gives greater rigidity, involves considerably more work, justified, however, by the results. A piece of stiff angle iron is bolted to the running boards, a hardwood block being interposed, as indicated,

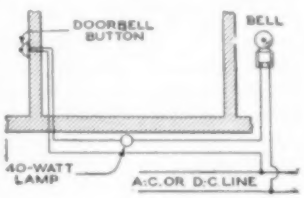


Two Systems of Reinforcing the Running Boards of a Light Car to Prevent Sagging: The Braces Also Permit the Carriage of Additional Weight on the Running Board

as a bearing for the ends of the brace. Two iron hooks are formed like the ones shown; these fit over the side channels of the chassis, with the threaded ends fitting into holes in the brace; they are drawn up tightly and locked with a castle nut and cotter pin.

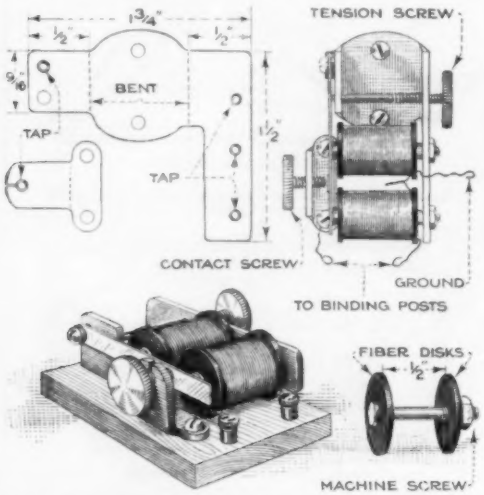
Using Bell on Lighting Systems

The drawing shows a method by means of which an electric doorbell is rung by current from the house-lighting system, without the use of a transformer, the necessary reduction in the strength of the current being obtained by the interposition of a 40-watt lamp in one side of the cell circuit. The advantage of this over the usual dry-battery system is apparent, and, while the voltage at the bell or button is not heavy enough to be dangerous, the bell should be wired with fully insulated wire, such as used in the wiring of the lighting system, instead of the usual thinly insulated bell wire.—W. A. Duncan, Toronto, Ontario.



A High-Tone Radio Buzzer

A buzzer with a clear, high-pitched tone is very desirable for radio-testing purposes, but, while it can be bought,



Operated by a Flat-Type Flashlight Battery, This Miniature Buzzer Produces the High-Pitched Tone So Desirable for Radio-Testing Purposes

such instruments are usually large, and cannot be used with a flashlight battery without exhausting it quickly. The home-made buzzer illustrated, however, is very small, and is particularly designed for flashlight-battery service.

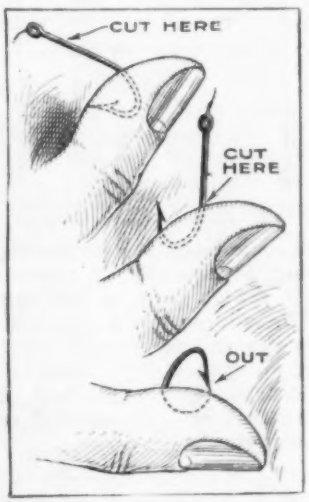
The magnets are wound around cores made from 6-32 iron machine screws, ¾ in. long, the hexagon heads of which are filed round. The spool ends are made from fiber disks, 7/16 in. in diameter, and holes are drilled through them to make a tight fit on the screws. A space, ½ in. long, is left between the disks for the winding, which is of No. 32 insulated wire; No. 30 wire, which is a trifle larger, can also be used, if necessary. Wind the space between the disks full, and, when finished, bring the ends out through small holes drilled in the disks, as shown. Then solder together the ends of the wires that begin the winding. One of the outside wires is grounded to the metal frame, and the other is connected to a binding post.

A piece of fairly stiff spring steel is used for the vibrator, which is mounted on the frame with a screw and two small washers. The tension screw merely presses against the vibrator. Contact points from spark coils, either new ones or old, which can be obtained for the asking at almost any garage, are soldered to the vibrator and the contact screw.

A piece of thick sheet brass or iron is cut to the pattern shown; then the necessary holes are drilled and tapped as indicated, a 9/32-in. tap being used for the threads. The screw holes at the center of the frame can be made to any convenient size; these holes are for the screws that fasten the instrument to its base. The bracket for holding the contact screw is made from a separate piece and mounted independently. After the hole for the contact screw has been drilled and tapped, a slot is cut through the bracket, and the ends squeezed together a little, to make a tight fit on the screw and prevent it from working loose. After all holes have been drilled and tapped, the frame is bent up as indicated by the dotted lines. Two binding posts are used for connecting the wires to the coils and contact-screw bracket.—Harry L. Gray, Independence, Ia.

Extracting Fishhook from Flesh

There is little that frightens a person so much as running a fishhook into the finger or flesh. The first impulse is to withdraw the hook by working it out at the point it entered; the barb, however, sticks in the flesh, and causes more or less suffering before it is finally removed, if removed at all without the aid of a physician. A simple method of taking out a hook is illustrated in the drawing. In the upper example the shank of the hook is cut at the point indicated and instead of working the hook out the way it entered it is pushed out as shown in the bottom drawing. When the barbed end of the hook is pushed out of the flesh, cut the shank again at the point shown in the middle drawing, take hold of the barb with the pliers, and turn it out; then cleanse the wound and apply antiseptics. For this as well as other purposes, the fisherman will find a small pair of wire-cutting pliers a useful article.



rigidity, involves con- Ontario. W. A. Duncan, Toronto,

PRIZE OFFERS AND ANNOUNCEMENTS

NATIONAL FEDERATION OF MUSIC CLUBS' EIGHTH PRIZE COMPETITION

The National Federation of Music Clubs announces its eighth prize competition for American composers. Prizes of from $1,000 to $100 each are offered for compositions of 10 different classes. The contest is open to all American citizens, except the violin solo which is open only to native-born Americans, preferably a woman. All compositions must be submitted before Dec. 15, 1922. Address, Mrs. Edwin B. Garrigues, Room 201 Bellevue-Stratford, Philadelphia, Pa.

PRIZES FOR THE BEST LIAISON SYSTEM BETWEEN ARTILLERY AND INFANTRY

Nothing is of more general interest to the army than an efficient means of liaison between the infantry and its supporting artillery. Up to the present no entirely satisfactory system has been evolved, and, therefore, to encourage its study, the American Army and Navy Journal is offering prizes of $100, $50, $25, and $15 for the best stories on the subject. For particulars address that journal at 354 Fourth Ave., New York City.

FOR THE BEST SYMPHONIC COMPOSITION A PRIZE OF $1,000 WILL BE AWARDED

For the encouragement and recognition of American composers, the proprietors of five of the largest moving-picture theaters in Chicago are offering a prize of $1,000 to the writer of the best symphonic composition submitted to them before Jan. 1, 1923. The five competing compositions considered next in order of merit will be performed by the Chicago Theater Symphony Orchestra at their Sunday noon concerts. The contest is open to all American citizens. Address, Balaban & Katz, 175 State St., Chicago, Ill.

LEGITIMATE INVESTORS INSTRUCTED BY A STOCK-EXCHANGE PLAYLET

Published by the New York Stock Exchange to show the way to safe and legitimate investments, ignorance of which has so often made investors the victims of fraudulent promoters and brokers, is a playlet entitled "Smith's First Investment." The play is a dramatization of a typical legitimate investment transaction. Copies can be obtained free by addressing Committee on Library, New York Stock Exchange.

PRIZE IS AWARDED SELECTED LIBRETTO WHICH IS NOW READY FOR COMPOSERS

The winning librettist in the $1,000 lyric-dance-drama contest offered by the National Federation of Music Clubs, in which $400 goes to the librettist and $600 to the composer, has been announced. Robert Francis Allen, of Coleraine, Mass., is the winner. Copies of the libretto will be ready for distribution among composers at an early date, and may be secured from Mrs. Edwin B. Garrigues, 201 Bellevue-Stratford, Philadelphia, Pa.

QUEBEC TO REWARD LITERARY EFFORT IN ANNUAL COMPETITIONS

To encourage the production of literary or scientific works in the province of Quebec, Can., an act of the legislative assembly provides that the sum of $5,000 shall be appropriated annually for the establishment of a fund for literary and scientific competitions. This initial amount of only $5,000 will be increased if the results of the competitions show justification for such action.

RATTLESNAKE CATCHING PURSUED FOR PROFIT AND PASTIME

There is no accounting for taste, but it is hard to realize how a man can be actually fond of handling rattlesnakes. Such a man, by the name of Ed Metgner, but more generally known as "Captain Snakes," for 10 years did nothing else but catch venomous reptiles in Texas and Mexico. During a period of nine months he is said to have captured 17,000 snakes, most of them rattlers. Though he has learned to do this work with little risk to himself, he has nevertheless been bitten 29 times by rattlers, and his body bears evidence of the fact by the number of scars on all parts of it. These bites have done him no harm; in fact, he claims that in one case the bite cured him of rheumatism. He neutralizes the snake's venom with permanganate of potash, which, he says, is an infallible antidote. He does not do this work for the fun of it alone, for he sells the snakes to zoos and shows, and to scientists.

PRIZES OFFERED IN SEARCH FOR OLDEST U. S. FARMERS

Search was recently made through a novel kind of prize contest, which closed August 10, for the oldest man and the oldest woman living on farms in the United States. Blanks were furnished which the venerable contestants filled in with their names and ages, and evidence that they lived on farms. The winner got $50 in gold and a free trip to the Central States Fair and Exposition, at Aurora, Ill.

ONE THOUSAND DOLLARS IN PRIZES FOR MUSICAL COMPOSITIONS

To stimulate the efforts of composers, a prize contest has been instituted by the Etude Music Magazine. There are offered 24 prizes for piano and vocal solos, and for anthems and part songs. The contest is open to composers of every nationality, and will close Dec. 1, 1922. Address, The Etude Prize Contest, 1712 Chestnut Street, Philadelphia, Pa.

THREE PRIZES OFFERED FOR BEST PHOTOS SUBMITTED TO A MAGAZINE MONTHLY

For photographs judged to be the best of those submitted during each calendar month, three prizes of $15, $10, and $5 are awarded by the magazine Motor. The photos must not have been published elsewhere. Address, 119 West 40th Street, New York City.

FOR A NAME TO REPLACE "SILVORE" VALUABLE PRIZES ARE OFFERED

For a name to replace "Silvore," the present name of silverplated ware made by the Seymour Manufacturing Company, it offers prizes to the value of $2,000. For conditions of the contest, address the company at Seymour, Conn.

WINNER OF CONTEST FOR HOTEL MEN TO GET A FREE TRIP TO EUROPE

Open only to "Greeters" in good standing, a prize contest is announced by Hotel Management, the winner of which will be given a free trip to Europe and return. While abroad, the winner will be guaranteed a position with pay at one of the best hotels in Paris. The winner of the contest will be the Greeter who, before April 1, 1923, sends to Hotel Management the largest number of business-promoting ideas that are acceptable for publication in the magazine. Address, Greeter Contest Editor, Hotel Management, 342 Madison Ave., New York City.

FOR BEST 50-WORD BUSINESS CODE THREE PRIZES ARE OFFERED

Prizes amounting to $225 for a 50-word business code are offered by the Farm Mortgage Bankers Association of America. The first prize will be $150, the second and third $50 and $25. The first 10 pages of the 1922 directory of the association, on file in all public libraries, will furnish the facts needed as a basis of the code. The contest closes Sept. 18, 1922. Address, Contest Committee, Farm Mortgage Bankers Association of America, 112 W. Adams Street, Chicago, Ill.

CONTESTS PREVIOUSLY ANNOUNCED

Medals, Diplomas, and Money Awards: Announced August issue, 1921; awards offered by the Franklin Institute.

For Service to City of Philadelphia: Prize $10,000; announced September issue, 1921; awarded each year by Edward Bok, former editor of The Ladies' Home Journal.

One Million Francs for Best Motor: Announced January issue, 1922; closes June 1, 1923; address, Aero Club of France, Paris.

Research Thesis by a Woman: Prize $1,000; announced October issue, 1921; awarded annually; address, Dr. Lilian Welsh, Goucher College, Baltimore, Md.

Annual Commercial Airplane Contest for "Italy's Great Trophy": announced, July issue, 1922; address, Aero Club of Italy.

Ideas for New Occupations for Shut-Ins: Prizes, $100, $50, and $25; announced July issue, 1922; closes Nov. 1, 1922; address, Prize Editor, Popular Mechanics Magazine, 6 North Michigan Ave., Chicago.

Fishing Contest: Prizes, seven "Model 94" Winchester hunting rifles; announced July issue, 1922; no definite closing date.

American Legion National Essay Contest: Prizes, $750, $500, and $250; announced August issue, 1922; closes Oct. 6, 1922; address, The American Legion, National Americanism Commission, Indianapolis, Ind.

Best Backyard Railroads: Prizes, 23, ranging from $25 to $2; announced August issue, 1922; closes Sept. 15, 1922; address, American Flyer Mfg. Co., 2219-39 South Halsted St., Chicago, Ill.

Best Novel by an American Author: Prize $2,000; announced August issue, 1922; closes March 1, 1923; address, Harper & Brothers, New York City.

Designs for Chicago Tribune Building: Prizes, $100,000; announced August issue, 1922.

Best Essay on a Historical Novel: Prize $100; announced September issue, 1922; closes Dec. 1, 1922; address, Kenyon College, Gambier, Ohio.

In answering prize offers please mention Popular Mechanics Magazine

LATEST DEVELOPMENTS IN SCIENTIFIC RESEARCH

LIFE YIELDS A FEW OF ITS SECRETS

The study of the action of narcotics and other drugs, and of the perception of smell and taste, has given information of fundamental importance respecting the character of living matter and assisted in solving many of the secrets of life; and from the information already gained, new and valuable drugs have been produced, and the future may yield a means for combating mosquitoes and like pests.

At one time it was suggested that after all, life was only a matter of chemistry, and that when the facts were found, all its processes could be represented in a series of chemical equations. It is of interest to note, however, that in recent progress made in this field, chemistry plays a smaller and smaller part in the ideas as knowledge proceeds. In the old conceptions, which appear quite natural, it was supposed that the actions of poisons, narcotics, and the like, were the result of chemical reactions. It appears now that effects of similar nature can be produced by substances of markedly different chemical nature, and that their action depends to an important extent upon whether or not they penetrate readily the walls of the living cells. In fact, the matter appears to be one more of physics than chemistry; and the size, arrangement, and conditions of the components of the cell, and the presence of a relatively large amount of surface determine much of the nature of living tissue.

Studies in this field have made threefold progress; first, in finding out more and more about the processes of life and its true nature; second, in the creation, so to speak, of new drugs that have the benefits of old ones without many of their disadvantages. For instance, surgery now possesses means for obtaining local anesthesia by reagents which were sought for and found as the result of a definite theory to illuminate the way. The same ideas and processes have already led to the production of not only new and valuable drugs of a more or less predetermined nature, but new perfumes, new antiseptics, and new flavoring materials. The third development yielded by this method of research is the recent production of repellents for insects, one of which is a substance effective against the body louse. Similar work may yield the discovery of repellents for house flies, mosquitoes, and fleas. Thus this study, far from being a matter of only academic interest, has resulted in achievements of the most practical importance in everyday life.

NEW ANALYSIS OF HEARING DISCOVERED BY LABORATORY EXPERIMENTS

Recent experiments on the sensitiveness of the ear to sounds of different pitches have yielded information of both theoretical and practical importance. It appears that, in people with defective hearing, there is a very definite connection between the peculiarities of their deafness and the results obtained by experiment.

In the experiments the intensity of a pure tone in a telephone receiver is varied by moving a slider along a wire. The slider is set at the point where the subject is just able to perceive a faint sound. By repeating this for a number of pitches, it is possible to construct a curve showing the relation between the sensitiveness of the ear and the pitch of the sounds.

Perceptible differences were found to exist even in normal ears, but in cases of defective hearing, characteristic curves were obtained which are quite distinctive. It appears possible to employ these curves for diagnosing the nature of any particular case of deafness, and to show and record the progressive development of the disease. For instance, in middle-ear deafness, the hearing may be nearly normal for high pitches but deficient for low tones. For deafness arising in the inner ear, defective hearing begins for a high pitch and may not extend to the low ones.

In nerve deafness, where the trouble arises not from any mechanical fault in the ear parts but in the nerves themselves, total deafness may exist for some range of pitches, and this may be surprisingly pronounced. In one such individual, a sound of 200,000,000,000 times the energy required to be heard by the normal ear failed to produce a sensation, though sounds of less than 1,600 double vibrations per second could be perceived. The experiments also indicate that the ear acts like a complex electrical or mechanical vibrating system, and no definite frequency can be assigned to any one member of it. These results have an important bearing on the theory of hearing, and will help solve many questions which have been puzzling the scientists for many years.

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